NUCLEAR SCIENCE ABSTRACTS

UNIVERSITY OF MINNESOTA
RECEIVED
OCT 8 1958
ENGINEERING
LIBRARY

September 30, 1958

Volume 12 Number 18
Abstracts 12106 – 12897

UNITED STATES ATOMIC ENERGY COMMISSION
Technical Information Service Extension, Oak Ridge, Tennessee

USAEC DEPOSITORY LIBRARIES

The libraries listed below maintain collections of unclassified U. S. Atomic Energy Commission reports for reference use by the general public. These depository collections are conveniently organized, and staff members of the libraries will assist requesters in the use of the collections. All the libraries have facilities for making photocopies of reports that are not more conveniently available in printed form from the Office of Technical Services. Canadian reports in the AECL series and currently issued British reports in the AERE and NP series are also available at the Libraries listed below. More complete sets of older British reports are available at those libraries identified with an asterisk (*).

ALABAMA
- Auburn, Alabama Polytechnic Institute Library
- Birmingham, Birmingham Public Library

ARIZONA
- Tucson, University of Arizona Library

ARKANSAS
- Fayetteville, University of Arkansas Library

CALIFORNIA
- *Berkeley, University of California General Library
- Los Angeles, University of California Library
- Menlo Park, Stanford Research Institute
- San Diego, San Diego Public Library

COLORADO
- Denver, Denver Public Library

CONNECTICUT
- New Haven, Yale University Library

DELAWARE
- Newark, University of Delaware Library

DISTRICT OF COLUMBIA
- Washington, Library of Congress

FLORIDA
- Coral Gables, University of Miami Library
- Gainesville, University of Florida Engineering Sciences Library

GEORGIA
- Atlanta, Georgia Institute of Technology Library

ILLINOIS
- *Chicago, John Crerar Library
- Chicago, University of Chicago Library
- Evanston, Northwestern University Library
- Urbana, University of Illinois Library

INDIANA
- Indianapolis, Indianapolis Public Library
- Lafayette, Purdue University Library

IOWA
- Ames, Iowa State College Library

KANSAS
- Manhattan, Kansas State College Library

KENTUCKY
- Lexington, University of Kentucky Library
- Louisville, University of Louisville Library

LOUISIANA
- Baton Rouge, Louisiana State University Library
- New Orleans, Tulane University Library

MARYLAND
- Baltimore, Johns Hopkins University Library
- College Park, University of Maryland Engineering and Physical Sciences Library

MASSACHUSETTS
- Cambridge, Harvard University Library
- Cambridge, Massachusetts Institute of Technology Library

MICHIGAN
- Ann Arbor, University of Michigan Library
- Detroit, Detroit Public Library

MINNESOTA
- Minneapolis, University of Minnesota Library

MISSOURI
- Kansas City, Linda Hall Library
- Rolla, The University of Missouri School of Mines and Metallurgy Library
- St. Louis, Washington University Library

NEW JERSEY
- Princeton, Princeton University Library

NEW MEXICO
- Albuquerque, University of New Mexico Library

NEW YORK
- Buffalo, Lockwood Memorial Library
- Ithaca, Cornell University Library
- New York, Atomic Industrial Forum
- New York, Columbia University Library
- *New York, New York Public Library
- Rochester, University of Rochester Library
- Schenectady, Union College Library
- Troy, Rensselaer Polytechnic Institute Library

NORTH CAROLINA
- Charlotte, Charlotte and Mecklenburg County Public Library
- *Durham, Duke University Library
- Raleigh, North Carolina State College Library

OHIO
- Cincinnati, University of Cincinnati Library
- Cleveland, Cleveland Public Library
- Columbus, Ohio State University Library
- Toledo, University of Toledo Library
- Youngstown, Youngstown University Library

OKLAHOMA
- Stillwater, Oklahoma State University Library

OREGON
- Corvallis, Oregon State College Library
- Portland, Portland Public Library

PENNSYLVANIA
- Philadelphia, University of Pennsylvania Library
- Pittsburgh, Carnegie Library of Pittsburgh
- University Park, Pennsylvania State University, Pattee Library

PUERTO RICO
- Rio Piedras, University of Puerto Rico, Main Library

RHODE ISLAND
- Providence, Brown University Library

SOUTH CAROLINA
- Columbia, University of South Carolina, McKissick Memorial Library

TENNESSEE
- Knoxville, University of Tennessee Library
- Memphis, Memphis Public Library
- Nashville, Joint University Libraries

TEXAS
- Austin, University of Texas Library
- College Station, Agricultural and Mechanical College of Texas Library
- Dallas, Southern Methodist University Library
- Houston, The Rice Institute Library
- San Antonio, San Antonio Public Library

UTAH
- Salt Lake City, University of Utah Library

VIRGINIA
- Blacksburg, Virginia Polytechnic Institute Library
- Charlottesville, University of Virginia, Alderman Library

WASHINGTON
- Pullman, State College of Washington Library
- Seattle, University of Washington Library

WEST VIRGINIA
- Morgantown, West Virginia University Library

WISCONSIN
- Madison, University of Wisconsin Library
- Milwaukee, Milwaukee Public Library

WYOMING
- Laramie, University of Wyoming Library

NUCLEAR SCIENCE ABSTRACTS

A Publication of the United States Atomic Energy Commission Technical Information Service.

r Science Abstracts (NSA) is intended to serve scientists and engi- working in the field of atomic energy by abstracting as completely and ngtly as possible the literature of nuclear science and engineering. It not only unclassified and declassified research reports of the U. S. Energy Commission and its contractors, but also material that ap- in research reports of other U. S. and foreign government agencies, ities, and industrial research organizations and in the technical and ic journals.

S

ssue of *NSA* is indexed by personal author and by report number. nual and annual index issues are prepared for each volume and in- ubject, corporate and personal author, and report number indexes, the availability of all USAEC reports abstracted. A cumulated report r, author, and subject index to Vols. 1 through 4 was issued as Vol. 4, B, Dec. 30, 1950.

ABILITY

issued twice a month and is available in single copies (priced ac- g to the number of pages they contain, plus postage on foreign orders) ubscription ($12.00 a year domestic, $15.00 a year foreign) from perintendent of Documents, U. S. Government Printing Office, Wash- 25, D. C.

ge of address notices for subscriptions should be sent to the above s. *NSA* is also available on an exchange basis to universities, re- institutions, industrial firms, and publishers of scientific informa- The USAEC invites inquiries from such organizations interested in ging publications.

iries about exchanges and other official distribution, as well as change ress notices for official and exchange recipients, should be sent to the cal Information Service Extension, U. S. Atomic Energy Commission, Box 62, Oak Ridge, Tennessee.

UCLEAR DATA

s in the past carried in issues 6B, 12B, and 18B lists of New Nuclear which experimental results were displayed in tabular form and, with ception of Vol. 11 (1957), in issue 24B carried an annual cumulation. nual cumulation for 1957 was issued as a separate publication. These New Nuclear Data were compiled by the Nuclear Data Group of the l Research Council, Washington 25, D. C.

r current data on radioactivity, nuclear energy levels, reactions, ts, etc., were also supplied by that group on 3 × 5 inch cards on an subscription basis. Beginning in January 1958 the Nuclear Data Group ssuing $8\frac{1}{2} \times 11$ inch Nuclear Data Sheets which replace the cards and corporate the table "Radioactivity, Levels, Abundances, Moments," as comprised the greater portion of the New Nuclear Data issues of *r Science Abstracts*. For this reason the quarterly issues of New r Data have been discontinued. The 1958 cumulation of New Nuclear nsisting of tables previously listed in the quarterly issues, and pos- ditional tables, will appear as issue 24B of *Nuclear Science Abstracts*

Nuclear Data Sheets are available in a light-weight stock for insertion ers and a heavy-weight stock for drawer filing. Annual subscription are $15 for the light and $18 for the heavy stock. Parcel post will be the U.S.A., printed matter mail elsewhere. Order from the Publi- cations Office, National Academy of Sciences-National Research Council, 2101 Constitution Avenue, Washington 25, D. C.

AVAILABILITY OF REPORTS ABSTRACTED

USAEC reports (as identified in the Numerical Index of Reports) are available free of charge to U. S. Government agencies and their contractors from the Technical Information Service Extension, Oak Ridge, Tennessee. Other requesters should obtain reports as described below.

AEC Reports The Office of Technical Services, Department of Commerce, Washington 25, D. C., is the sales agency for AEC unclassified reports, although a small number of other AEC unclassified reports are available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. The sales availability of each report is given in the abstract. The symbol "OTS" indicates availability from the Office of Technical Services, and "ph" and "mf" indicate photostat and microfilm copy. The form is not specified if the report is available in printed form. Sales availability is also given in the semiannual and annual Numerical Index of Reports.

Price lists of the Office of Technical Services and of the Superintendent of Documents may be obtained upon request from these sales agencies. Reports should be ordered by report number and title. A check or money order made payable to the Treasurer of the United States should accompany each order. Foreign purchasers of reports, other than those in Canada and Mexico, should include an additional amount for postage, according to the scale that four pages approximate one ounce. It is the purchaser's responsibility to compute the necessary postage since rates vary for different countries.

The USAEC has made contractual arrangements for the sale of microcopy of AEC reports from the Microcard Foundation, P. O. Box 2145, Madison 5, Wisconsin, and the Readex Microprint Corporation, 115 University Place, New York 3, N. Y.

Many reports abstracted in *NSA* may be published subsequently in scientific and technical journals and books. The pertinent publication information is listed in the semiannual and annual cumulations of the Numerical Index of Reports and in the *Cumulated Numerical List of Available Unclassified U. S. Atomic Energy Commission Reports* (TID-4000).

USAEC reports also may be consulted at the AEC depository libraries listed on the inside front cover. Collections of AEC reports outside the United States have been established and are being maintained at those addresses listed on the inside back cover.

Non - AEC Reports Reports prepared by organizations not under contract to the USAEC (as identified in the Numerical Index of Reports) should be requested from the issuing agency indicated in the abstract of the report. Requests for reports abstracted under NP numbers should give title and author since these numbers are assigned by the USAEC and may not be known by the originating agency. British and Canadian reports are available for examination at the AEC depository libraries. British reports can also be purchased from the British Information Service (identified in the abstract as BIS), 30 Rockefeller Plaza, New York, N. Y. Canadian reports (AECL series) can be purchased from the Scientific Document Distribution Office, Atomic Energy of Canada Limited, Chalk River, Ontario, Canada.

Translations Copies of translations prepared by the USAEC and its contractors are available from the Special Libraries Association Translation Center, John Crerar Library, 86 E. Randolph Street, Chicago 1, Illinois.

U. S. Patents Copies of U. S. patents are available from the U. S. Patent Office, Department of Commerce, Washington 25, D. C., for $0.25 per copy.

The printing of this publication has been approved by the Director of the Bureau of the Budget, July 30, 1957.

CONTENTS

Volume 12, Number 18, September 30, 1958

Category	Abstract	Page
GENERAL	12106	1437
Atomic Bombs and Warfare	12110	1437
Atomic Power	12113	1438
Research Programs	12115	1438
BIOLOGY AND MEDICINE	12117	1438
Radiation Effects	12121	1439
Radiation Hazards and Protection	12143	1442
Radiotherapy	12205	1448
Toxicology Studies	12206	1449
Tracer Applications	12207	1449
CHEMISTRY	12215	1450
Aerosols	12248	1455
Analytical Procedures	12249	1455
Crystallography and Crystal Structure	12269	1458
Deuterium and Deuterium Compounds	12271	1458
Fluorine and Fluorine Compounds	12274	1459
Graphite	12276	1459
Laboratories and Equipment	12278	1459
Molecular Structure	12283	1460
Radiation Chemistry	12286	1460
Radiation Effects	12296	1462
Rare Earths and Rare-earth Compounds	12302	1463
Separation Procedures	12307	1463
Sorption Phenomena	12319	1466
Spectroscopy	12321	1466
Syntheses	12324	1467
Tracer Applications	12327	1467
Transuranic Elements and Compounds	12328	1467
Uranium and Uranium Compounds	12331	1468
Waste Disposal	12343	1469
ENGINEERING	12345	1470
Heat Transfer and Fluid Flow	12353	1471
Materials Testing	12367	1472
Radiography	12372	1473
Waste Disposal	12373	1473
MINERALOGY, METALLURGY, AND CERAMICS	12375	1474
Ceramics and Refractories	12377	1474
Corrosion	12382	1474
Geology and Mineralogy	12393	1476
Metals and Metallurgy	12398	1477
Tracer Applications		1482
PHYSICS	12443	1482
Aerosols	12473	1486
Astrophysics	12475	1486
Cosmic Radiation	12476	1486
Crystallography and Crystal Structure	12479	1487
Electrical Discharge	12489	1488
Electrons	12502	1490
Gases	12507	1490
Instruments	12512	1491
Isotopes	12533	1493
Isotope Separation	12546	1495
Mass Spectrography	12552	1496
Mathematics	12554	1496
Measuring Instruments and Techniques	12567	1497
Mesons	12605	1502
Meteorology	12626	1504
Molecular Properties	12630	1505
Neutrons	12632	1506
Nuclear Physics	12641	1509
Nuclear Properties	12658	1509
Nuclear Reactors	12681	1511
Nuclear Transformation	12782	1524
Particle Accelerators	12797	1526
Radiation Absorption and Scattering	12818	1528
Radiation Effects	12848	1532
Radioactivity	12852	1533
Rare Earths and Rare-earth Compounds	12858	1533
Shielding	12862	1534
Spectroscopy	12869	1535
Theoretical Physics	12875	1535
Uranium and Uranium Compounds	12890	1537
NUMERICAL INDEX OF REPORTS		INDEX-1
PERSONAL AUTHOR INDEX		INDEX-3

ERRATA

NSA Vol. 6, No. 2, p. 76. In abstract 598, W. E. Flanagan should be W. F. Flanagan.

NSA Vol. 6, No. 5, p. 187. In abstract 1467, W. E. Flanagan should be W. F. Flanagan.

NSA Vol. 6, No. 5, p. 195. In abstract 1529, add author, N. B. Skeats.

NSA Vol. 10, No. 6, p. 356. In abstract 2884, Jack Chernik should be Jack Chernick.

NSA Vol. 10, No. 10, p. 424. In abstract 3333, Raymod F. Fish should be Raymond F. Fish.

NSA Vol. 10, No. 23, p. 1361. In abstract 11779, Edward Connors, Jr. should be Edward Conners, Jr.

NSA Vol. 11, No. 12A, p. 668. In abstract 6213, report No. SC-4073 should be SC-4073(TR).

NSA Vol. 11, No. 20, p. 1243. In abstract 11231, Zhur. Fiz. Khim should be Zhur. Obshchei Khim.

NSA Vol. 11, No. 22(Suppl.), p. 1453. In abstract 13081, report No. CF-52-1-144(Del.) should be CF-52-1-144(Del. 2).

NSA Vol. 12, No. 1, p. 80. In abstract M-356(Book I, II, III), American Cyanamid Co. Stamford Labs., Stamford, Conn. should be American Cyanamid Co. Stamford Research Labs., Stamford, Conn.

NSA Vol. 12, No. 5, p. 415. In abstract AD-130129, secondary number (MET-481-575PRI) should be (MET-481-575PRI).

NUCLEAR SCIENCE ABSTRACTS

Volume 12 Number 18 September 30, 1958

GENERAL

12106 NP-6795
American Consulate General, Frankfurt Am Mein. Science Div.
GERMAN SCIENCE BULLETIN NO. 27. June 1958. 45p.

Scientific studies in the field of atomic energy and related fields being carried out in West Germany at the present time are briefly reviewed. (W.L.H.)

12107 NP-6805
Olin Mathieson Chemical Corp. Niagara Falls, N. Y.
CURRENT LITERATURE ABSTRACT BULLETIN. VOL. 7, NO. 6. F. J. Celli. June 1958. 42p. Contract AF33(600)-33920.

One hundred seven abstracts from the current literature on boron compounds are given. An author index is included. (A.C.)

12108 NYO-4746
Massachusetts Inst. of Tech., Cambridge.
QUARTERLY PROGRESS REPORT FOR THE PERIOD JULY 1, 1957–SEPTEMBER 30, 1957. Bernard E. Proctor, Samuel A. Goldblith, and Philip M. Richardson. Sept. 30, 1957. 100p. Contract AT(30-1)-1952. $15.30 (ph OTS); $5.40 (mf OTS).

A selected bibliography of radiation applications for the period July–Dec. 1956 is presented. Applications are grouped into physical effects, penetration of matter, biological effects, insect and fungus control, radiation chemistry, and isotopes. (For preceding period see NYO-4745.) (W.D.M.)

12109
MAGNETIC PROPERTIES OF N-TYPE SILICON. E. Sonder and D. K. Stevens (Oak Ridge National Lab., Tenn.). Phys. Rev. 110, 1027-34(1958) June 1.

The magnetic susceptibility of n-type silicon samples with a wide range of donor concentrations (3×10^{16} to 3×10^{19} atoms/cm^3) has been measured as a function of temperature from 3 to 300°K. By utilizing conduction-electron concentrations obtained from Hall coefficient measurements on comparison specimens over the range from 50 to 400°K, the contributions to the susceptibility arising from the conduction electrons and electrons trapped on donor atoms have been analyzed. In the upper range of temperature the diamagnetic contribution of conduction electrons is dominant and is consistent with the model of six energy minima in the conduction band. However, comparison of the squared reciprocal mass ratio with that obtained from cyclotron-resonance experiments reveals that the former is appreciably smaller than the latter (~8 as compared to ~13). As the temperature is lowered, the conduction-electron contribution becomes successively less as electrons are frozen out on donor atoms. The trapping of electrons by donors at low temperatures leads to a Curie-law paramagnetism in the specimens of higher purity, whereas in the more impure samples, deviations from Curie's law occur which are attributed to interactions between closely spaced donor centers. (auth)

Atomic Bombs and Warfare

12110 BNL-496
Brookhaven National Lab., Upton, N. Y.
THE DISTRIBUTION OF FALLOUT ACTIVITY IN RAINFALL AT BROOKHAVEN NATIONAL LABORATORY, JUNE TO SEPTEMBER 1957. F. P. Cowan and J. Steimers. Mar. 1958. 9p. $0.50(OTS).

A rain collector was designed and built for collecting hourly samples of rainfall. This collector was used to collect samples more or less continuous from May to October 1957 during the continental weapons test series. The samples collected were analyzed for gross activity, particulate activity, and three specific isotopes, Mo^{99}, I^{131}, and Sr^{90}. A decay curve was obtained for one sample from each of the principal rains occurring during the summer. The objective of the program was to determine the time sequency of arrival of fall-out activity in precipitation and to study fluctuations in composition as revealed by chemical analysis. The ultimate objective of measurements such as these is to gain information about the atmospheric transport of bomb debris. (W.L.H.)

12111 WT-1191
National Records Management Council, Inc., New York.; Safe Mfgrs. National Assn., New York.; and Federal Civil Defense Administration, Battle Creek, Mich.
EFFECTS OF A NUCLEAR EXPLOSION ON RECORDS AND RECORDS STORAGE EQUIPMENT. Apr. 1956. 43p. Project 35.5 [of] OPERATION TEAPOT. $1.25 (OTS).

The objectives of Project 35.5 were to determine the effects of a nuclear explosion on various types of records and records storage equipment. In Apple II shot, materials and storage equipment normally found in government, business, and archival institutions were placed at 11 different unshielded distances from Ground Zero in a zone where severe damage to surface structures was expected. Other records and equipment were placed within different type structures located in a zone where severe damage was expected and in a zone where little damage was expected. Of 22 units of unshielded storage equipment containing records, only six units were accessible with contents intact. The records and

equipment placed within the structures were virtually undamaged. This would indicate that records housed within the type of equipment tested would survive if protected by some type of structure, except for damage resulting from debris, fire, and water. However, the best protection was afforded by the basement (below ground level) of the structures even though the upper stories collapsed and were destroyed. (auth)

12112

BRIEF SUMMARY OF GAMMA RADIATION SPECTRA FROM RESIDUAL RADIATION SOURCES FOLLOWING A NUCLEAR DETONATION. R. L. Mather (U. S. Naval Radiological Defense Lab., San Francisco). pp. 35-7 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission–Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

Empirical data on the nature of the gamma radiation fields following various weapon detonations are summarized. Gamma-ray scintillation spectroscopy was applied in the analysis of soil samples for residual activities at various times following nuclear detonations. Data are presented graphically. (C.H.)

Atomic Power

12113

SHIP PROPULSION BY NUCLEAR POWER. 2. K. Illies (Univ. of Hamburg and Hanover Tech. Univ.). Atomics and Nuclear Energy 9, 208-11(1958) June.

An assessment of the practicability of nuclear power to ships fitted with gas turbines with special reference to tankers is presented. (auth)

12114

TRENDS IN POWER GENERATION. LESSONS FOR NUCLEAR ENGINEERS. H. E. Roberts (Federal Power Commission, Washington). Nucleonics 16, No. 7, 76-9 (1958) July.

Electric utilities, both public and private, are building larger steam plants. Plant size has tripled since 1938 and will quadruple by 1961. The large plants are more economical than the small ones. Regional demands, fuel costs, maintenance and fixed costs, and cost trends all give economic justification for the construction of large steam plants. These considerations would justify the nuclear engineer's assumption of high plant factors to compute potential power costs with nuclear equipment. (J.S.R.)

Research Programs

12115 NP-6822 (Rpt: UNCLASSIFIED)

European Organization for Nuclear Research, Geneva. ANNUAL REPORT—1957. 86p.

Included are sections on the progress and structure of CERN, activities carried out under the authority of the director-general, the proton synchrotron, the synchro-cyclotron, scientific and technical services, the site and buildings, administration, CERN publications, the list of colloquium lectures held at Geneva-Meyrin in 1957, and the list of lectures and colloquia of the Theoretical Study Division in Copenhagen. No data are presented. (For preceding period see NP-6359.) (M.H.R.)

12116 NP-6825

Joint Establishment for Nuclear Energy Research, Kjeller, Norway.

SIXTH ANNUAL REPORT FOR JULY 1956—JUNE 1957 OF THE NETHERLANDS'-NORWEGIAN JOINT ESTABLISHMENT FOR NUCLEAR ENERGY RESEARCH. 31p.

A summary of the main activities of the Joint Establishment for Nuclear Energy Research is given covering the following: the operation of JEEP, isotopes, chemistry, metallurgy, reactor engineering, studies on nuclear propulsion, physics, health physics, Technical Information Service, JENER reactor courses, building program, international cooperation, personnel and accounts, and attendance at international conferences. (For preceding period see NP-6321.) (M.H.R.)

BIOLOGY AND MEDICINE

12117 UR-520

Rochester, N. Y. Univ. Atomic Energy Project. THE BIOCHEMICAL AND PHYSIOLOGICAL FUNCTIONS OF THE CELL SURFACE. Aser Rothstein. Jan. 20, 1958. 29p. Contract W-7401-eng-49. $4.80 (ph OTS); $2.70(mf OTS).

The physiological and biochemical functions of the surface of the yeast cell are reviewed. Topics discussed include the enzymes of the cell surface, the compartmentalization of the surface layers, ion binding properties, permeability, the transfer of sugars into the cell, and active transport of ions such as potassium, hydrogen, phosphate, magnesium, and manganese. (auth)

12118

INFLUENCE OF THE NUCLEOLUS ON MITOSIS AS REVEALED BY ULTRAVIOLET MICROBEAM IRRADIATION. Mary Esther Gaulden and Robert P. Perry (Oak Ridge National Lab., Tenn.). Proc. Natl. Acad. Sci. U. S. 44, 553-9(1958) June.

Exposure of one nucleolus in a grasshopper neuroblast to a microspot of high-intensity ultraviolet radiation for 3 seconds permanently stops mitosis of cells irradiated in stages from late telophase to the middle of middle prophase. During the latter half of middle prophase, the cell becomes mitotically less sensitive to nucleolar irradiation and by late prophase is completely insensitive to it. Microspot irradiation of a non-nucleolar region of the nucleus causes mitotic delay but does not usually prevent cell division. These observations support the hypothesis that the nucleolus has an intimate functional relation to the mitotic process. (auth)

12119

COMMENTS ON FRANCK'S THEORY OF THE PRIMARY QUANTUM CONVERSION PROCESS IN PHOTOSYNTHESIS. Gordon Tollin (Univ. of California, Berkeley). Arch. Biochem. Biophys. 75, 539-41(1958) June.

The function of chlorophyll in the primary quantum conversion process in photosynthesis is discussed. (C.H.)

12120

RADIOMIMETIC SUBSTANCES. Charlotte Auerbach (Inst. of Animal Genetics, Edinburgh). Radiation Research 9, 33-47(1958) July.

Radiomimesis at the pharmacological level led to the discovery of the mutagenic effects of mustard gas, but is not necessary or sufficient indication of mutagenic ability. Carcinostatic action, which often is due to chromosome breakage, is a better guide in the search for mutagens. The best definition of radiomimetic substances is that they produce gene mutations and chromosome breakage. A closer analysis of these effects

reveals similarities as well as differences between mutations and chromosome breaks which have been produced by radiation or chemicals. The most interesting differences is the greater degree of specificity which some chemical mutagens show in their effects on chromosome regions and individual genes. Only for a few substances is there evidence that they are radiomimetic in the sense of being "hit" poisons; but there are general grounds for believing that most chemical mutagens will act in this way. Hydrogen peroxide, organic peroxides, and, possibly, solutions of formaldehyde are radiomimetic in their chemical action. There is no evidence that this is so for any other class of chemical mutagens, and for purines there is evidence that they are not radiomimetic in their chemical action on the genetic material. (auth)

Radiation Effects

12121 CRB-785

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

POPULATION RISES FROM RADIATION. H. B. Newcombe. June 1958. 12p. (AECL-647). $0.50 (AECL).

Presented at a public meeting of the United Nations Association, Friday, May 30, 1958, Ottawa.

Genetic effects of radiation from nuclear weapon tests are discussed. An attempt is made to arrive at numerical estimates of long-term hazards. (C.H.)

12122 NP-6778

Polish Academy of Sciences. Inst. of Nuclear Research, Warsaw.

THE EFFECT OF X-IRRADIATION ON δ-AMINOLAEVULIC ACID DEHYDRASE IN VITRO. Report No. 18/XRB. A. Dancewicz and B. Lipiński. Apr. 1958. 14p.

The effect of x rays on δ-aminolaevulic acid dehydrase in vitro was investigated in the dose range between 0 to 70,000 r. The reversible inactivation of this enzyme in the irradiated ox liver homogenate is not significant, in extracts devoided of insoluble protein ballast, a decrease of activity of about 16% at dose 60,500 r. was observed. Solutions of purified dehydrase exhibit a decrease of activity dependent on radiation dose and enzyme concentration. The increase of ultraviolet absorption in range of 240–280 mμ wave length was found in purified enzyme solutions after irradiation with 70,000-r dose. These findings indicate that the ratio of aromatic amino-acids tyrosine/tryptophan in protein molecule of this enzyme is greater than 1. (auth)

12123

EFFECT OF IONIZING RADIATION ON THE DEVELOPMENT OF PHOTOSYNTHESIS IN ETIOLATED WHEAT LEAVES. F. B. Gailey and N. E. Tolbert (Oak Ridge National Lab., Tenn.). Arch. Biochem. Biophys. 76, 188-95(1958) July.

Doses of gamma radiation as high as 150 kr delayed the greening of etiolated wheat plants in the light by as much as 10 hr. The irradiated plants developed a complete photosynthetic mechanism, as determined by $C^{14}O_2$ incorporation into normal products. The inhibition of greening caused by gamma radiation could be overcome by exposure to white light, but was not changed after 24 hr in the dark. Conversion of protochlorophyll to chlorophyll was not affected by gamma radiation. The normal lag between the beginning of sustained chlorophyll synthesis and the development of photosynthetic CO_2 fixation did not occur after gamma radiation. (auth)

12124

THE EFFECT OF IONIZING AND ULTRAVIOLET RADIATIONS ON PHOTOSYNTHESIS. L. P. Zill and N. E. Tolbert (Oak Ridge National Lab., Tenn.). Arch. Biochem. Biophys. 76, 196-203(1958) July.

Fixation of CO_2 by Chlorella was destroyed by 5 min ultraviolet irradiation. Under the same irradiation, wheat retained about 25% of normal CO_2 fixation because of protection by absorption of radiation in the leaf. Sucrose synthesis seems particularly sensitive to ultraviolet light. Continued normal oxygen evolution despite decreased CO_2 fixation after gamma irradiation suggests independent action of gamma radiation on the carbon cycle and the photolytic system. The inhibition of carbon dioxide fixation was greatest immediately after gamma irradiation. Normal CO_2 fixation was found after a 5-hr postirradiation exposure to light. (auth)

12125

THE EFFECTS OF RADIATION ON THE STABILITY OF RADIO-IODINATED HUMAN SERUM ALBUMIN. H. J. G. Bloom (Royal Marsden Hospital, London) and D. J. Crockett and F. S. Stewart (Mount Vernon Hospital and Radium Inst., Northwood, Middlesex, Eng.). Brit. J. Radiol. 31, 377-83(1958) July.

The effect of radiation on the in vivo stability of I^{131}-labelled human serum albumin (IHSA) has been investigated, with the object of revealing whether self-irradiation is a significant factor affecting the stability of available preparations. Samples externally irradiated in doses up to 200,000 rads with x rays from a 4 Mev linear accelerator were injected intravenously into human volunteer subjects and the urinary excretion of activity was measured over a period of six to nine days. Fast (degraded) and slow (stable) components were identified by their differing rates of excretion and their proportions were determined for each sample. The effect of radiation was to increase the percentage of fast component, to an extent proportional to the dose, without materially influencing the rate of excretion of the slow component. For a given preparation a constant weight of albumin per milliliter was converted to the rapidly excreted form per unit dose of radiation, irrespective of concentration. This finding is in accord with the theory of indirect action of radiation on solutions and explains the protection afforded by increasing the protein concentration. The effects of self-irradiation only become significant where the specific activity exceeds about 100 microcuries I^{131} per milligram of albumin. (auth)

12126

PHOSPHORUS METABOLISM IN YEAST ACCOMPANYING AN INHIBITION OF CELL DIVISION BY X-RAYS. Edward Spoerl and Della Looney (U. S. Army Medical Research Lab., Fort Knox, Ky.). J. Bacteriol. 76, 63-9(1958) July.

The phosphorus and nitrogen content of continuously irradiated and nonirradiated yeast cultures was measured at 0, 2, 4, and 6 hr as the cultures grew rapidly for most of this time. Division was completely stopped at a 3.9 kr/hr X-radiation dose, but not at a 2 kr/hr dose, while growth was reduced relatively little. A striking change in irradiated cells was an increase in acid insoluble polyphosphate at 2 hr. Pentosenucleic acid phosphorus and protein nitrogen on a dry weight basis also increased in irradiated cells as compared to nonirradiated cells. Amounts of phos-

phorus and nitrogen in the trichloracetic acid extract decreased, as did the phosphorus of the lipid extract. Apparently no reduction in deoxypentosenucleic acid formation had occurred at 2 hr, and thus an effect on this material did not appear responsible for the inhibition of cell division. It is conceivable that the polyphosphate increase was related to the inhibition of this cell function. (auth)

12127

CARBOHYDRATE METABOLISM IN YEAST ACCOMPANYING AN INHIBITION OF CELL DIVISION BY X-RAYS. Edward Spoerl and Della Looney (U. S. Army Medical Research Lab., Fort Knox, Ky.). J. Bacteriol. 76, 70-4(1958) July.

The carbohydrate constituents of rapidly growing yeast cells were found to change in amount both in irradiated and unirradiated cells. Growing cultures were sampled at 0, 2, 4, and 6 hr either as controls or as continuously irradiated cells. Irradiated-cell mannan was less than the control at each sampling, though it did not decrease progressively. Glucan decreased to the greatest extent; a bigger radiation dose and a longer time period both produced a greater effect. Acid-extracted glycogen responded as did glucan, while total glycogen showed a significant decrease only at 6 hr. Trichloracetic acid extract carbohydrate also did not decrease until 6 hours. Total carbohydrate was reduced at each sampling period; at 6 hours it was 56 per cent of the control. Irradiation produced an increased cell permeability and the loss of some cell contents. (auth)

12128

MAN-MADE RADIATIONS AND THE REPRODUCTIVE CELLS. T. C. Carter (M R C Radiobiological Research Unit, Harwell, Eng.). New Scientist 4, No. 79, 27-9 (1958) May 22.

Four things are assessed to forecast the genetic effect of exposing a human population to ionizing radiation: the amount of radiation exposure, the extent by which this exposure has raised the mutation rate, the extent by which this rise in the mutation rate will raise the level of mutant genes, and the extent to which this raised level of mutant genes will increase the amount of illness in the population. Exposures to various sources are estimated. (W.D.M.)

12129

THE CONTROL OF PESTS IN GRAIN BY GAMMA IRRADIATION. P. B. Cornwell (Tech. Irradiation Group, Atomic Energy Research Establishment, Harwell, Berks, Eng.). New Scientist 4, No. 79, 30-3(1958) May 22.

The possibilities of gamma irradiation of grains for control of insect pests are discussed. Because the cost of radiation treatment increases with the dose, its application to disinfecting grain would make use of the small dose (10,000 rad) for reproductive sterilization. (W.D.M.)

12130

THE INFLUENCE OF X-RAYS ON THE INCREASED VASCULAR PERMEABILITY, IN EXPERIMENTAL ANIMALS. B. N. Mogil'nitskii and E. D. Savchenko. Ocherki po sosudistoi pronitsaenosti, med. 40-4(1956), (Translated from Referat. Zhur. Biol. No. 16, 1957 Abstract No. 71260)

Intravenous introduction of histamine (0.15 mg/kg) into rabbits produced an increase in capillary permeability particularly obvious in the central nervous system, liver, kidneys, and myocardium. The greatest rise in permeability appeared after 1 to 2 days and was sustained for 8 days. If the histamine-poisoned rabbits were subjected to whole-body x-ray irradiation of small doses (20 r), then in the majority of animals (19 out of 24) the increased permeability began to decrease after the second irradiation. (auth)

12131

GENETIC STUDIES OF IRRADIATED NATURAL POPULATIONS OF DROSOPHILA. II. 1957 TESTS. Wilson S. Stone and Florence D. Wilson (Univ. of Texas, Austin). Proc. Natl. Acad. Sci. U. S. 44, 565-75(1958) June.

Genetic analyses were made of irradiated and control isolated populations of D. ananassae from the Pacific Proving Ground area, others of the Marshall Islands, and Ponape. These tests show that the Bikini and Rongelap populations were severely damaged genetically by the direct radiations and fallout from the thermonuclear device exploded on March 1, 1954. The Rongerik atoll populations had recovered from fallout by August 1955 – a period roughly equivalent to 26 generations. The populations collected at Rongelap and Bikini had not recovered then, but the Rongelap population had recovered by 1956, in 40 or more generations. Because of the heavier irradiation on Bikini – including effects of the weapons tests in 1956 – this population was still slightly below other Pacific Island populations even in 1957. The general relations and comparisons between these isolated island populations and other Drosophila populations are discussed. (auth)

12132

THE EFFECT OF IRRADIATION ON THE SERUM GLUTAMIC-OXALACETIC TRANSAMINASE LEVEL. Robert L. Brent, Mary M. McLaughlin, and Joseph N. Stabile (Walter Reed Army Medical Center, Washington). Radiation Research 9, 24-32(1958) July.

The serum glutamic-oxalacetic transaminase was determined in bith rabbits and rats after 700 r whole-body irradiation. Some of the rats were also given 5000 r to the liver region. A significant but small rise appeared in the rabbits 24 hours after irradiation. No significant alteration occurred in the transaminase level of the rats, either in those receiving whole-body irradiation or in those receiving 5000 r to the liver. An explanation is offered for the transaminase rise in the rabbit and also for the lack of rise in the rat. It is concluded that this is a poor test for biological dosimetry because the elevation due to radiation is too small and also because there is no correlation between the elevation and likelihood of death. (auth)

12133

HISTOLOGICAL RESPONSE OF THE DUODENUM TO X-IRRADIATION IN HYPOPHYSECTOMIZED RATS. Burton L. Baker, John F. Kent, and Edward C. Pliske (Univ. of Michigan, Ann Arbor). Radiation Research 9, 48-58(1958) July.

Thirty to 81 days after hypophysectomy of the rat there was a reduction in thickness of the duodenal mucosa accompanied by reduction in size of villi and crypts of Lieberkühn. The epithelial cells associated with these structures were somewhat smaller and in the crypts exhibited a moderate reduction in intensity of cytoplasmic basophilia. Paneth cells were smaller and contained fewer serous granules and less cytoplasmic ribonucleic acid. Total-body x-radiation was administered to hypophysectomized rats 20 to 43 days after the operation at doses of 500 r, 600 r, 775 r, and 1200 r. Nonhypophysectomized controls were treated similarly. After allowance was made for the histo-

logical alterations induced by hypophysectomy alone, the histological changes elicited by x-radiation, or the rate of recovery from them, were not significantly different in hypophysectomized as compared with non-hypophysectomized rats. (auth)

12134

"AIR" DOSE, TISSUE DOSE, AND DEPTH DOSE OF THE COSMIC-RAY BEAM IN THE ATMOSPHERE. Hermann J. Schaefer (U. S. Naval School of Aviation Medicine, Pensacola, Fla.). Radiation Research 9, 59-76(1958) July.

It is shown that limits can be derived for the ratio of cosmic-ray air dose to tissue dose from the altitude profile of the total ionization in air. The necessity for distinguishing between total ionization and absorption events of high-energy concentration in cosmic-ray dosimetry is pointed out. It is concluded that in biological experimentation with heavy primaries, accurate information can be obtained only by direct monitoring during exposure. (T.R.H.)

12135

THE INFLUENCE OF NON-IONIZING RADIATION ON THE CATALASE AND HEMATOLOGICAL INDICES IN THE BLOOD, IN ANIMALS UNDER NOVOCAINE ANAESTHESIA. I. P. Neshchadimenko, M. S. Kostenko, and V. A. Shkapina. Zdrav. Belorus. No. 11, 51-2 (1956). (Translated from Referat. Zhur. Biol. No. 16, 1957, Abstract No. 71263)

The general clinical picture, activity of catalase, and blood morphology of irradiated animals, subject to amitol or Novocain anesthesia of the skin of the back or belly, is the same as in irradiated control animals. In the development of radiation syndrome, at first there occurred reduction of the white and then red blood cells, and also the lowering of catalase activity. (auth)

12136

GEOMETRICAL AND ENERGY FACTORS INFLUENCING THE EFFECT OF PENETRATING RADIATIONS ON MAN. V. P. Bond (Brookhaven National Lab., Upton, N. Y.). pp. 65-80 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

The complexity of the evaluation of precise radiation hazards in man is discussed. The influence of the geometry of exposure and of beam energy on the depth-dose pattern obtained in tissue-equivalent material simulating a large animal or man was determined for a variety of exposure techniques used in the laboratory, and for the initial and fall-out gamma radiations from an atomic explosion. The available LD_{50} values for large animals obtained under various conditions of exposure are compared to those predicted from combinations of exposure geometry and beam geometry. LD_{50} values are given in terms of air dose, as well as tissue dose. The considerations set forth are discussed in terms of application to LD_{50} values for man. At present there appears no better estimate of the LD_{50} for man than the currently accepted 400 to 500 r. Data are presented indicating that the acute LD_{50} value, in terms of mid-line tissue dose, may be appreciably lower than this figure. (C.H.)

12137

REPAIR ASSOCIATED WITH THE EROSIVE EFFECTS OF FALLOUT DAMAGE IN INDIVIDUALS AND POPULATION GROUPS. Paul S. Henshaw (U. S. Atomic Energy Commission, Washington). pp. 87-92 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

Effects induced in living systems by radiation from pervasive sources such as fall-out are reviewed. Three types of pathological effects are identified, and the kinds of repair accompanying each are discussed. (C.H.)

12138

RATE OF REPAIR OF RADIATION DAMAGE IN MICE. John B. Storer (Los Alamos Scientific Lab., N. Mex.). pp. 93-9 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

The repair rates in the gastrointestinal tract and hematopoietic system were measured indirectly in mice following x irradiation by the split-dose technique. (C.H.)

12139

APPROACHES TO THE QUANTITATIVE ESTIMATION OF RADIATION INJURY AND LETHALITY. George A. Sacher (Argonne National Lab., Lemont, Ill.). pp. 101-12 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

The present status of the theories of radiation lethality is discussed briefly. A formal theory of lethality is developed and presented as an approach devised for the purpose of obtaining information about lethality, which is regarded as a physiologic process. It is shown that the lethality process is polyphasic, and that the several species studied appear to show considerable independent variation in the amplitudes of different phases. The development of an adequate lethality syndrome for man requires knowledge of several independent parameters. The estimation of these parameters by nondestructive methods will be possible when they can be given a correct physiologic interpretation. The linear model may have utility for prediction of the effects of time-dependent exposure patterns, but its range of validity must first be determined by experiments with such patterns. (C.H.)

12140

RECOVERY FROM LATENT RADIATION INJURY IN RELATION TO PERMISSIBLE HUMAN EXPOSURE. H. A. Blair (Univ. of Rochester School of Medicine and Dentistry, N. Y.). pp. 113-18 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

The effect of radiation exposure on the life span of man is discussed. Available data are reviewed. It is concluded that for a dose of 200 r received over a short period of time the consequent life-shortening would be as much as 6%, or about 4 years. For a dose of about 100 r, life shortening would be about 2%. Existing data indicate that the after effects of successive exposures are additive, therefore two exposures of 200 r widely separated would shorten life twice as much as one. However, 400 r in a single prompt dose would be expected to shorten life as much as 30 or 40%, since life-shortening in rodents increases rapidly with the magni-

tude of the single prompt dose as the dose approaches the lethal range. (C.H.)

12141

MATHEMATICAL AIDS IN THE UNDERSTANDING OF THE BIOLOGICAL HAZARDS OF RESIDUAL RADIATION. James T. Brennan (Walter Reed Army Medical Center, Washington). pp. 127-33 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

A mathematical treatment is presented of the idealized contaminated plane surface. Mathematical methods employed in computing radiation hazards are discussed. (C.H.)

12142

THE EFFECTS OF FALLOUT RADIATION ON THE SKIN. Robert A. Conard (Brookhaven National Lab., Upton, N. Y.). pp. 135-42 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

Physical and biological factors related to skin damage from close-in fall-out are discussed. Problems associated with estimating the beta doses to the skin from fall-out are reviewed. Data are presented based on the accidental exposure of some 240 Marshallese, 28 Americans, and 23 Japanese fishermen during Operation Castle, March 1954. Data are included from several other cases of human exposure to fission products or beta emitting material either accidentally or experimentally. (C.H.)

Radiation Hazards and Protection

12143 AERE-C/R-2583

United Kingdom Atomic Energy Authority. Research Group. Chemistry Div., Woolwich Outstation, England.

RADIOACTIVE AND NATURAL STRONTIUM IN HUMAN BONE. U. K. RESULTS FOR 1957. F. J. Bryant, E. H. Henderson, G. S. Spicer, M. S. W. Webb, and T. J. Webber. May 1958. 11p. $0.45(BIS).

Methods previously published for the determination of strontium-90, have been modified to deal with samples containing significant quantities of strontium-89. Results of analyses for strontium-90, strontium-89 and natural strontium in specimens arising in 1957 are given. The median level in children in the 0 to 5 years age group was 1.0 S.U. Sr^{90} as against 0.7 S.U. in 1956, but some increase was expected as most samples in 1957 came from areas with fall-out above the average for the U.K. (auth)

12144 AFSWC-TN-57-22

Air Force Special Weapons Center, Kirtland AFB, N. Mex.

THE INTERNAL DOSE TO VARIOUS ORGANS AS A FUNCTION OF ISOTOPIC COMPOSITION OF THE FISSION PRODUCTS IN A REACTOR WITH A SPECIFIC HISTORY OF OPERATION. James O. Alderman and Kent C. Humpherys. May 1957. 63p. Project 1809. (AD-134699).

An evaluation was made of the relative importance of the various isotopes formed in a reactor to the radiation dose which might result from internal deposition following a reactor accident. Tabulated data and graphs are presented for use in making calculations of the internal dose which might be expected in any specific case, regardless of reactor power level and mode of operation. For the case of the reactor with a history of operation used in this report, and neglecting (n,γ) reaction, it is concluded that the external dose resulting from a 10 curie-sec/m^3 exposure in an infinite cloud is 4.2 roentgens, a definite upper limit. The internal hazard is markedly greater than the external hazard from a 10 curie-sec/m^3 exposure to U^{235} fission products at times greater than 4 hours after a reactor accident. (C.H.)

12145 HW-47578

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

A CONTINUOUS RIVER SAMPLING SYSTEM AND METHODS OF RADIOCHEMICAL ANALYSES FOR STRONTIUM-89, 90, BARIUM-140, AND PHOSPHORUS-32. W. B. Silker. Jan. 14, 1957. 10p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Equipment for continuous sampling of the Columbia River was installed at Pasco, Washington, and has been operating for over one year. The sampler has required only a minimum of maintenance such as routine lubrication of the pumps. Concentration of cationic activities is accomplished by ion exchange on a bed of Amberlite XE-100 activated in the hydrogen cycle. Analysis for strontium-89, strontium-90, and barium-140 is performed on the sample thus obtained. A general sample, a composite collected over the same period of time, is reserved for the analysis of radioactive anions, notably phosphorus-32. (auth)

12146 ISC-771

Ames Lab., Ames, Iowa.

HAZARDS ASSOCIATED WITH THORIUM METALLURGY. A. F. Voigt. [1957]. 32p. Contract [W-7405-eng-82]. $6.30(ph OTS); $3.00(mf OTS).

The permissible limits established for handling of thorium are discussed. The information is divided into sections on chemical toxicity, radiological toxicity (internal and external), and fires and explosions. (T.R.H.)

12147 TID-7551

Division of Reactor Development, AEC and Harvard Univ., Boston. School of Public Health.

FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT HARVARD AIR CLEANING LABORATORY, BOSTON, JUNE 24-27, 1957. 163p. $2.00(OTS).

(Separate abstracts of each of the papers presented have been prepared.)

12148 TID-7551(p.1-4)

Argonne National Lab., Lemont, Ill.

PARTICULATE AIRBORNE CONTAMINATION AT START-UP OF THE EBWR. J. J. Hartig and J. A. Pagliaro. p.1-4 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 4p.

High levels (up to 5×10^{-7} μc/cc) of radioactivity from airborne particulate matter were discovered at the initial full power operations of the Experimental Boiling Water Reactor. How the isotopic composition and the source of the activity were determined is described. The level was reduced by using a Vapor Recovery System on the air ejector which consisted of an H_2-O_2 recombiner, Freon condenser, an alumina bed and a charcoal trap. (T.R.H.)

12149 TID-7551(p.5-8)
Argonne National Lab., Lemont, Ill.
AIR CLEANING ACTIVITIES AT ANL. D. P. O'Neil. p.5-8 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 4p.

The present status and future plans for air cleaning systems of the fuel fabrication facility, the senior cave, and the inert gas cave at Argonne National Laboratory are discussed. Investigation of the efficiency of hood prefilters is described. (T.R.H.)

12150 TID-7551(p.8-16)
Brookhaven National Lab., Upton, N. Y.
AIR SAMPLING IN RELATION TO THE METEOROLOGICAL PROGRAM AT BNL. Robert M. Brown. p.8-16 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 9p. (BNL-3323).

Also issued separately as BNL-3323 and previously abstracted in NSA, Vol. 12, abstract No. 2434.

12151 TID-7551(p.17-23)
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
TWO GAS CLEANING PROBLEMS AT THE IDAHO CHEMICAL PROCESSING PLANT SITE. D. M. Paige, P. N. Kelly, and E. S. Grimmett. p.17-23 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 7p.

The original gas disposal arrangement for RaLa Process (stack disposal with storage for unfavorable meteorological conditions) not proving adequate, an off-gas scrubber system was studied. Experimental data are given. Gas cleaning problems associated with the fluidized bed calciner for radioactive waste solutions are discussed. (T.R.H.)

12152 TID-7551(p.23-4)
Brush Beryllium Co., Cleveland.
AIR CLEANING ACTIVITIES AT BRUSH BERYLLIUM COMPANY. Hal J. Shafer. p.23-4 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 2p.

Air cleaning practices and equipment used at Brush Beryllium Co. are briefly reviewed. (T.R.H.)

12153 TID-7551(p.24-6)
Beryllium Corp., Reading, Penna.
AIR CLEANING ACTIVITIES OF THE BERYLLIUM CORPORATION. A. Epstein. p.24-6 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 3p.

Air cleaning practices and equipment used at Beryllium Corp. are briefly reviewed. (T.R.H.)

12154 TID-7551(p.26-8)
Oak Ridge National Lab., Tenn.
AIR CLEANING ACTIVITY AT OAK RIDGE GASEOUS DIFFUSION PLANT. R. C. Smith. p.26-8 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 3p.

A discussion of fluorine recovery, fluorine determination in air, and measurement of radioactive dust contamination in air at a gaseous diffusion plant is presented. (T.R.H.)

12155 TID-7551(p.28-9)
Dow Chemical Co. Rocky Flats Plant, Denver.
AIR CLEANING OPERATIONS AT THE ROCKY FLATS PLANT. Robert J. Walker. p.28-9 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 2p.

The efficiency, service life, and fire hazards of filters used at the Rocky Flats Plant are discussed. (T.R.H.)

12156 TID-7551(p.30-1)
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
AEC BETTIS PLANT AIR CLEANING ACTIVITIES. P. R. Bolton and J. E. Ross. p.30-1 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 2p.

The types and performance of filters used at Bettis Plant for removal of radioactive particulates and acid fumes and mists from process air are outlined. Both wet and dry collectors are described. (T.R.H.)

12157 TID-7551(p.32-3)
Westinghouse Electric Corp. [Atomic Power Div.], Pittsburgh.
AIR CLEANING EXPERIENCE AT THE NAVAL REACTOR FACILITY. J. R. Horan. p.32-3 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 2p.

Control of airborne radioactive contamination in connection with the S1W plant is discussed. Primary system leakage, secondary system leakage, and hot cell and lab exhausts are considered. (T.R.H.)

12158 TID-7551(p.33-5)
General Electric Co. Aircraft Nuclear Propulsion Dept., Idaho Falls, Idaho.
AIR CLEANING ACTIVITIES AT GE-ANP IDAHO TEST STATION. R. M. Chatters. p.33-5 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 3p.

The meteorological problems complicating stack disposal at NRTS are discussed, and research initiated on the problem is briefly described. (T.R.H.)

12159 TID-7551(p.35-40)
Knolls Atomic Power Lab., Schenectady, N. Y.
AIR CLEANING OPERATIONS AT KAPL. W. H. Truran. p.35-40 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY. JUNE 24-27, 1957. 6p.

The air cleaning systems at Knolls Atomic Power Laboratory are briefly described and operating experience such as preventive maintenance inspection, maintenance, filter service life, and cleaning is summarized. (T.R.H.)

12160 TID-7551(p.40)
Atomics International Div., [North American Aviation, Inc.], Canoga Park, Calif.
AIR CLEANING ACTIVITIES OF ATOMICS INTERNATIONAL. A. A. Jarrett. p.40 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 1p.

12161 TID-7551(p.41-3)
Goodyear Atomic Corp., Portsmouth, Ohio.
AIR CLEANING ACTIVITIES AND ASSOCIATED STUDIES AT GOODYEAR ATOMIC CORPORATION.

Ben Kalmon. p.41-3 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 3p. (GAT-R-34).

Air cleaning is summarized with respect to welding fumes, metal dusts, degreasers, and mercury. A special $U^{235}F_6$ problem is briefly discussed. Surveys of surrounding areas to determine the distribution and extent of fluoride contaminant released to the atmosphere are discussed. (T.R.H.)

12162 TID-7551(p.44-5)
Cambridge Filter Corp., Syracuse, N. Y.
DEVELOPMENTS IN HIGH EFFICIENCY AIR FILTRATION. Paul M. Engle. p.44-5 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 2p.

Adhesiveless Absolute filters, Absolute filters with plastic separators, cylindrical filters, Aerosolve prefilters, and filter manufacture are briefly discussed. (T.R.H.)

12163 TID-7551(p.45-6)
Flanders Mill, Inc., Riverhead, N. Y.
DEVELOPMENTS IN THE MANUFACTURE OF ABSOLUTE FILTERS. A. R. Allan, Jr. p.45-6 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 2p.

The properties of an all-ceramic filter for high-temperature use are discussed. (T.R.H.)

12164 TID-7551(p.47-50)
Mine Safety Appliances Co., Pittsburgh.
DEVELOPMENTS IN THE MANUFACTURE OF ULTRA-AIRE SPACE FILTERS. Robert A. Bub. p.47-50 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 4p.

Development of a fire resistant filter for use at AEC sites is described. (T.R.H.)

12165 TID-7551(p.50-2)
Hanford Operations Office, AEC.
FIRE-RESISTIVE FILTER PROGRESS AT HAPO. Don J. Keigher. p.50-2 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 3p.

Experience with filter fires is reviewed, and the criteria for a fire-safe filter are outlined. Specifications for frame, filter medium, loading, capacity, efficiency, separators, adhesives, and gasket for a fire-resistive filter are given. (T.R.H.)

12166 TID-7551(p.53-65)
General Electric Co. [Hanford Atomic Products Operation.] Richland, Wash.
MOISTURE AND BURNING TESTS OF SPACE FILTERS. J. H. Palmer. p.53-65 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 13p.

A moisture-resistant filter was selected and modified to improve its fire resistance. The equipment for the moisture and burning tests and the test results are described and depicted. (T.R.H.)

12167 TID-7551(p.65-7)
[General Electric Co.] Hanford Atomic Products Operation, Richland, Wash.
APPLICATION OF FIRE-RESISTANT AIR CLEANING FILTERS AT HAPO. F. E. Adley. p.65-7 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 3p.

Two laboratory hood filter unit fires are described, and observations on combustible filters are made. Results of some burning tests on filter construction materials are listed. (T.R.H.)

12168 TID-7551(p.67-84)
Battelle Memorial Inst., Columbus, Ohio.
DESIGN AND CALIBRATION OF AN IMPROVED CASCADE IMPACTOR FOR SIZE ANALYSIS OF AEROSOLS. R. I. Mitchell and J. M. Pilcher. p.67-84 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 18p.

The operating principle and theory of cascade impactors are investigated and discussed. An improved design resulting from the studies was built and calibrated. The instrument meets most of the requirements for general studies of aerosols. (T.R.H.)

12169 TID-7551(p.84-91)
Oak Ridge National Lab., Tenn.
A MULTIBED LOW VELOCITY AIR CLEANER. Robert E. Yoder and Fleming M. Empson. p.84-91 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 8p.

An air cleaner for the off-gases from processes which fix radioactive wastes in a sintered form for disposal is described. The components of the multibed cleaner are sand, soda lime, and activated carbon. Experimental data used in selecting the materials used are given, and experiments with the cleaner are described. The device removes greater than 99.995% of particulates and all fission-product gases except Kr and Xe. (T.R.H.)

12170 TID-7551(p.91-2)
California. Univ., Berkeley. Radiation Lab.
AIR CLEANING OPERATIONS AT UCRL. M. D. Thaxter. p.91-2 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 2p.

12171 TID-7551(p.92-7)
Harvard [Univ.], Boston. School of Public Health.
ECONOMIC SURVEY OF AIR AND GAS CLEANING OPERATIONS WITHIN THE AEC. Richard Dennis, Charles E. Billings, and Leslie Silverman. p.92-7 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 6p.

How a survey of air and gas cleaning operations at AEC sites is to be conducted is discussed. The information gathered will make it possible to establish design and cost criteria leading to economical, more efficient air and gas cleaning. A copy of a proposed questionnaire is included. (T.R.H.)

12172 TID-7551(p.98-107)
Los Alamos Scientific Lab., N. Mex.
AIR CLEANING COSTS—A STUDY OF THREE SYSTEMS. Harry S. Jordan. p.98-107 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 10p.

The air cleaning facilities at Los Alamos Scientific Laboratory for DP West Site, CMR Building, and Ten Site are described. The cost figures at each location are given including depreciation, operation, mainte-

nance, and original cost of installation. The wet methods are found inherently more expensive than dry filtration. It is recommended that consideration be given to the ease of changing filter media, especially in highly contaminated places where special equipment and procedures are required. (T.R.H.)

12173 TID-7551(p.108)
Illinois. Univ., Urbana.
STUDY OF THE FUNDAMENTAL PROPERTIES OF AEROSOLS. H. F. Johnstone. p.108 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 1p.

Work on removal of aerosols from gases by introducing charged pellets at the center of a cyclone is reported. (T.R.H.)

12174 TID-7551(p.109-13)
Harvard [Univ.], Boston. School of Public Health.
AIR CLEANING STUDIES AT HARVARD UNIVERSITY (1956-57). Leslie Silverman. p.109-13 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 5p.

Several projects are mentioned which are covered by the papers following this one. The use of slag wool coated with Ag for I^{131} removal is discussed. The efficiency of slag wool filters on fly ash was investigated and data are tabulated. (T.R.H.)

12175 TID-7551(p.114-19)
Harvard [Univ.], Boston. School of Public Health.
FURTHER INVESTIGATIONS OF THE CONTINUOUS SLAG WOOL FILTER. C. E. Billings, C. Kurker, Jr., E. C. Hickey, L. H. Levenbaum, and L. Silverman. p.114-19 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 6p.

A new continuous slag wool filter for high-temperature fume of open hearth furnace was used in pilot plant studies. Filter tests with and without a particle agglomerator are described and discussed. (T.R.H.)

12176 TID-7551(p.120-9)
Harvard [Univ.], Boston. School of Public Health.
SLAG WOOL FOR ACID GAS AND MIST REMOVAL. Charles Kurker, Jr., Charles E. Billings, and Leslie Silverman. p.120-9 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 10p.

Three mineral fibers, Kaowool, Mineralite, and Baldwin-Hill, were evaluated for their efficiency in removing H_2SO_4, SO_3, SO_2, HNO_3, N_2O_4, and HF from gas streams. It was found that 2-in. filters at 4 lb/cu ft packing density remove 30 to 80% of acid mist and 72% of acid gases. Slag wool is useful for combined simultaneous removal of acid gases, mists, and solids. (T.R.H.)

12177 TID-7551(p.130-2)
Harvard [Univ.], Boston. School of Public Health.
AGGLOMERATION OF PARTICULATE MATERIALS. Edward C. Hickey, C. E. Billings, and Leslie Silverman. p.130-2 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 3p.

The mechanism of agglomeration of particulate materials was investigated. An instrument was constructed and tested for measurement of agglomeration of iron oxide fume less than 0.2 μ. A 3-in. laboratory screw agglomerator was constructed and tested, the data for which are discussed. (T.R.H.)

12178 TID-7551(p.133-9)
Harvard [Univ.], Boston. School of Public Health.
PROGRESS REPORT ON FILTRATION OF A FRESHLY GENERATED NaK FUME. Edward Kristal, Richard Dennis, and Leslie Silverman. p.133-9 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 7p.

Absolute filters, high-efficiency roughing filter, combination of the two, slag wool filter, curled glass fiber filter, curled Saran fiber filter, bulk Dynel fiber filter, were tested for filtration of a mixed sodium and potassium oxide fume. The last mentioned material approached the requirements, presenting the following characteristics: air flow, 700 cfm (180 fpm); initial resistance 13.0 in. water; final resistance 15 in. water; efficiency, 90%; fume holding capacity, 0.5 lb. for a 24 × 24 × 24-in. filter. (T.R.H.)

12179 TID-7551(p.140-59)
Harvard [Univ.], Boston. School of Public Health.
DEVELOPMENT OF A "TRIBOELECTRIFIED" FLUIDIZED BED FOR AEROSOL FILTRATION. David M. Anderson and Leslie Silverman. p.140-59 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY JUNE 24-27, 1957. 20p.

The theory of triboelectrification, fluidization and electrostatics is discussed prior to presentation of data on mechanical production of static charge on fluidized bed media. Other studies on fluidization are reported. Results of performance tests (collection efficiency) of an experimental apparatus are tabulated and discussed. (T.R.H.)

12180

SAFETY FOR ATOMIC WORKERS. F. R. Paulsen. Atomics and Nuclear Energy 9, 189-93, 197(1958) June.

The safety of atomic workers, ensured by protective clothing, monitors, health physics services, regular medical checks, shielding, glove boxes, and remote control, is discussed. (auth)

12181

RADIATION AND ITS HAZARDS. C. W. Shilling (U. S. Atomic Energy Commission). Atomics and Nuclear Energy 9, 198-201(1958) June.

The possible hazards of nuclear weapon tests, nuclear warfare, and radiation therapy are discussed. (auth)

12182

BRIEF HISTORY OF THE NATIONAL COMMITTEE ON RADIATION PROTECTION AND MEASUREMENTS (NCRP) COVERING THE PERIOD 1929-1946. Lauriston S. Taylor (National Committee on Radiation Protection and Measurements). Health Phys. 1, 3-10(1958) June.

The National Committee on Radiation Protection and Measurements was established in the United States in 1929, since which time it has provided the basic standards and guidance in the field. Through the co-operation of many organizations this has proven to be an effective program. At the same time through interlocking membership between the NCRP and the International Commission on Radiation Protection, the views of this country have been integrated into the world views. A brief listing of the activities of the NCRP and its reports is given. (auth)

12183

WHAT IS HEALTH PHYSICS? Walter D. Claus (U. S. Atomic Energy Commission, Washington). Health Phys. 1, 56-61(1958) June.

The scope of the science of health physics is outlined. (C.H.)

12184

RADIATION EXPOSURE AS A REASONABLE CALCULATED RISK. Lauriston S. Taylor (National Bureau of Standards, Washington). Health Phys. 1, 62-70(1958) June.

Maximum permissible exposures for radiation workers have been based, in the main, on levels that would not produce detectable injury to any individual. The impossibility of correlating radiation effects with small radiation dosage makes it impracticable to use this criteria indefinitely. It must be assumed that there is some undesirable effect from radiation exposures, even though these are not specifically detectable. We are thus confronted with the necessity for accepting some risk due to radiation exposure, even though this risk cannot be specifically defined. The addition of a risk philosophy in the establishment of radiation protection standards and the acceptance of occupational exposure becomes a necessity, if we are to continue the proper exploitation of radiation as a servant to man. Some comparison of the risk due to various types of radiation exposure is given. (auth)

12185

HEALTH PHYSICS RESPONSIBILITIES TO MANAGEMENT. G. Hoyt Whipple (Univ. of Michigan, Ann Arbor). Health Phys. 1, 71-5(1958) June.

Health physics is a relatively new and rapidly expanding profession. As a consequence its aims and responsibilities are neither well-defined nor generally understood. With the frank intent of promoting discussion, this paper outlines the kinds and degrees of services that a health physicist may be called upon to render to the management of a company that is embarking upon radioactive work for the first time. A health physicist in such a company has four principal areas of responsibility: the safety and health of plant employees, the safety and health of the public, adequate legal basis for protection, and an economical operation. The general manner in which these responsibilities are met in the design, development and operation of a plant is described, and an attempt is made to show how critically the evolution of health physics as a respected profession depends at this stage on the performance of the individual practioner. (auth)

12186

EXPOSURE CRITERIA FOR EVALUATING THE PUBLIC CONSEQUENCES OF CATASTROPHIC ACCIDENTS IN LARGE NUCLEAR PLANTS. F. P. Cowan and J. B. H. Kuper (Brookhaven National Lab., Upton, N. Y.). Health Phys. 1, 76-84(1958) June.

Various types of direct exposure to the fission product cloud from a catastrophic reactor accident are analyzed and expressed in terms of an acceptable emergency dose (AED) due to 1 c-sec/m^3 of exposure. The problem of combining these exposures is considered and criteria are suggested for four categories of personal injury. Indirect exposure due to deposition of fission products is also considered and limits are suggested to be associated with evacuation and varying degrees of restrictions on the use of land. This paper is a condensation of a more detailed development of exposure criteria included in a study of the consequences of catastrophic reactor accidents carried out by a group at Brookhaven National Laboratory. A very brief summary of the methods and results for the whole study is given in an appendix. (auth)

12187

BIOLOGICAL EFFECT OF A MAGNETIC FIELD AND THE RADIATION SYNDROME. M. F. Barnothy and J. M. Barnothy (Univ. of Illinois, Urbana). Nature 181, 1785-6(1958) June 28.

A series of experiments on mice exposed in a homogeneous magnetic field of several thousand gauss indicated that magnetic treatment will not decrease considerably the mortality rate of mice irradiated in the lethal range. Data on lymphocyte count and body weight at various intervals during the experiments are presented graphically. (C.H.)

12188

THE IMMUNE STATUS OF LONG-TERM SURVIVORS OF LETHALLY X-IRRADIATED MICE PROTECTED WITH ISOLOGOUS, HOMOLOGOUS, OR HETEROLOGOUS BONE MARROW. N. Gengozian, T. Makinodan, C. C. Congdon, and R. D. Owen (Oak Ridge National Lab., Tenn.). Proc. Natl. Acad. Sci. U. S. 44, 560-5 (1958) June.

The immune status of lethally irradiated mice treated with isologous, homologous, or heterologous rat bone marrow was studied by injecting sheep or rat RBC antigens into the protected mice 200 to 300 days after treatment. The results showed the foreign bone marrow-protected mice to have a subnormal immune mechanism, provided that the foreign transplant persisted in these animals, whereas the isologously treated mice responded in a normal manner. Two postulates are considered in the interpretation of this subnormal immune mechanism: the lowered immune response is a quantitative expression of the functional antibody tissue remaining in these mice after recovery from the foreign bone marrow reaction, or that an in vivo antigen-antibody reaction persists in these animals and consequently affects their ability to respond normally to other antigens. Emphasis is placed on a re-evaluation of the concept of tolerance as applied to the long-term survivors of the foreign marrow-protected mice. (auth)

12189

RADIO-ACTIVE FALL-OUT AND ITS HAZARDS TO MAN. W. R. McMurray (South African National Physical Research Lab.). S. African Med. J. 31, No. 49, 1246-52(1957) Dec. 7.

The facts concerning radio-active fall-out from the testing of fission-type nuclear weapons are reviewed and summarized in a form convenient to the assessment of the resultant effects on man. These are seen to be twofold, namely the genetic effect and the effects of ingested strontium-90. The genetically effective dose from fall-out is compared with the very variable naturally occurring background radiation dose and it is concluded that the genetic aspect of fall-out hazard is relatively unimportant. The remaining uncertainties in the estimates of the effects of ingested strontium-90 are not sufficient to completely invalidate conclusions based on the available data. It is shown that should nuclear-weapon testing continue at its present rate of 10 Megatons per year, the dose of strontium-90 to the bone should not exceed the average dose from natural sources. The strong dependence of the intensity of natural background on the human environment is emphasized as a very relevant consideration. (auth)

12190

DELAYED DEATHS IN SUBLETHALLY X-RAYED F_1 HYBRID MICE INJECTED WITH PARENTAL STRAIN

SPLEEN CELLS. Leonard J. Cole and Marie E. Ellis (U. S. Naval Radiological Defense Lab., San Francisco). Science 128, 32-3(1958) July 4.

Reactions are described which were observed in irradiated and non-irradiated mice following injection with parental strain spleen homogenates. The contributions of strain, antigenic response, and homogenate particle size to lethal effects are discussed. (C.H.)

12191

IMMUNO-ELECTROPHORETIC STUDY OF THE SERUM OF MICE IRRADIATED BY LETHAL DOSES OF X-RAY AND PROTECTED BY RAT BONE MARROW. Pierre Grabar, Janine Courcon, John P. Merrill, Peter L. T. Ilbery, and John F. Loutit (Institut Pasteur, Paris and Atomic Energy Div., Harwell, Eng.). Transplantation Bull. 5, 58-60(1958) Apr.

An immuno-electrophoretic technique was used in the analysis of the blood serum from irradiated mice treated with intravenous injections of suspensions of rat bone marrow. Results showed that the serum albumin of the chimeras reacted with anti-mouse sera while their gamma globulins only reacted with anti-rat serum. The chimera gamma globulin showed an electrophoretic mobility identical with that observed in the normal rat and slower than that seen with the gamma globulin from serum of normal mice. Possible explanations for these immunological responses are presented. (C.H.)

12192

SURVIVAL OF IRRADIATED MICE AFTER TREATMENT WITH REPOPULATED BONE MARROW. Paul Urso, Thomas W. McKinley, Jr., and Charles C. Congdon (Oak Ridge National Lab., Tenn.). Transplantation Bull. 5, 60-3(1958) Apr.

A comparison was made of the survival rates of mice exposed to 900 r x radiation after treatment with repopulated isologous and repopulated homologous bone marrow. Transfer of isologous bone marrow from irradiated mice treated with isologous bone marrow consistently gave a high percentage of 30- and 60-day survivors. In homologous bone transfers, when the repopulated marrow was left in the original host mouse for 60 to 64 days after injection of rat bone marrow, irradiated recipient II mice of the original host strain showed excellent 30-day survival and a reduction in the number of delayed deaths. The effects produced by the repopulated bone marrow from mice treated with homologous bone marrow are presumably caused by recovery of sufficient host cells during the 60 days after irradiation to give an isologous survival response in the new host. (C.H.)

12193

IRRADIATION OF PERSONNEL DURING DIAGNOSTIC PROCEDURES. R. E. Novikova. Vestnik Rentgenol. i Radiol. 33, 68-71(1958) Jan.-Feb. (In Russian)

A review is presented of 3 reports delivered at the annual meeting of the British Institute of Radiology, November, 1954. The doses for the personnel irradiated during fluoroscopy, roentgenology and certain diagnostic procedures are listed in tables. Measures decreasing the doses are suggested. The problems of radiational protection for a direct and a focal bundle of rays, as well as from diffuse radiation, are discussed. (tr-auth).

12194

OCCUPATIONAL DISEASES IN ROENTGENOLOGISTS AND RADIOLOGISTS. E. D. Semiglazova. Vestnik Rentgenol. i Radiol. 33, 71-5(1958) Jan.-Feb. (In Russian)

The results of examination of 168 persons working in x ray and radiological darkrooms are presented. This number consisted of 60 doctors, 97 x ray and radio technicians, and 11 orderlies. The first stage of radiation sickness was diagnosed in 21, the second in 12, and the third in 2. Chronic radiation sickness appears to be an occupational disease in roentgenologists and radiologists and appears in 4 to 6 years after they begin work. Prophylaxis of chronic radiation sickness in people of this profession is discussed. (tr-auth)

12195

METEOROLOGY—FALLOUT AND WEATHERING. Lester Machta and Kenneth M. Nagler (U. S. Weather Bureau, Washington). pp. 3-11 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

Meteorology plays two roles in the study of the biological effects of nuclear radiations on man. Winds and rain govern the transport of fission products to man's environment, and, after settling on the ground, the fallout particles may have their effects modified by rain washing and wind erosion. Both roles are discussed. (C.H.)

12196

THE APPLICATION OF AUTOMATIC WASHDOWN TO PITCHED ROOFS. A. J. Breslin (U. S. Atomic Energy Commission, New York). pp. 19-21 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

Results are reported from tests on the efficiency of wash water for the removal of radioactive contamination from roofs. Structural panels mounted on a tilting easel were sprinkled with calcium carbonate dust to simulate fall-out contamination. The wash water was applied by means of a distribution pipe or by a garden spray nozzle. The wash down water was collected and analyzed. Smooth aluminum surfaces with the water applied by means of a distribution pipe were most easily decontaminated. Simulated gravel surfaces with the water applied by spray retained the contaminating material longest. (C.H.)

12197

INTERNAL DOSE FROM SHORT-LIVED RADIONUCLIDES. Karl Z. Morgan (Oak Ridge National Lab., Tenn.). pp. 149-60 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

National and international standards for radiation protection are discussed. Maximum permissible occupational exposure data are tabulated for a number of isotopes. (C.H.)

12198

PLUTONIUM CONTAMINATION FOUND OFF-SITE FOLLOWING ONE-POINT DETONATIONS. M. W. Carter and O. R. Placak (U. S. Public Health Service, Las Vegas, Nev.). pp. 185-7 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958.

236p. Available from U. S. Government Printing Office for $1.75.

A series of four experiments were conducted to determine if accidental detonation of nuclear devices could occur, and, if so, the potential spread of contamination resulting from accidental detonation of devices. The efficiency of air and soil monitoring equipment was tested. A workable method for decontamination of relatively large soil areas was tested, which consists of removal of topsoil in the areas of highest contamination, and harrowing, wetting, compacting, and stabilizing the balance of the area involved. (C.H.)

12199

RETENTION OF SUB-MICRON AEROSOLS IN THE HUMAN RESPIRATORY TRACT. J. N. Stannard and P. E. Morrow (Univ. of Rochester, N. Y.). pp. 189-95 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

Particle size was found to be a cardinal parameter in respiratory tract deposition. The distribution of radioactivity in a fall-out field may or may not be the same as the distribution of particle sizes. Factors affecting the deposition and retention of sub-micron radioactive aerosols in the human respiratory tract and the possible damage caused by particles which may be present in a fall-out field are discussed. (C.H.)

12200

THE SHORT TERM BIOLOGICAL FATE AND PERSISTENCE OF RADIOACTIVE FALLOUT AS MEASURED AT VARIOUS LOCATIONS WITHIN FALLOUT PATTERNS. R. G. Lindberg and K. H. Larson (Univ. of California at Los Angeles). pp. 197-204 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

Data are presented which were collected during weapons testing programs and up to one year following fall-out contamination of an environment. The components studied include air, soil, vegetation, native rodents, and fall-out concentration. The predominant size of fall-out particles greater than 100 microns in diameter decreased with distance from Ground Zero while the less than 100 micron material did not decrease but remained the same or increased with distances up to 200 miles from Ground Zero. The smaller size material tended to be more soluble, and, therefore, more available to the biological cycle. The majority of particles retained by foliage were below 44 microns in diameter having an average size of approximately 20 microns. It is concluded that the amount of any specific isotope in any particular location within the fall-out pattern will be highly variable, and the occurrence of areas in which the biological accumulation of that isotope is high are to be anticipated. (C.H.)

12201

RESIDUAL CONTAMINATION OF PLANTS, ANIMALS, SOIL, AND WATER OF THE MARSHALL ISLANDS TWO YEARS FOLLOWING OPERATION CASTLE FALLOUT. H. V. Weiss (U. S. Naval Radiological Defense Lab., San Francisco). pp. 205-10 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

A survey was made two years post-detonation to determine the persistence and fate of radioactive material in the biological systems and in the physical environment of those Marshall Islands contaminated by fall-out from the March 1, 1954, thermonuclear weapon detonation. Specimens of land and marine animals, birds, vegetation, soil, and water were collected for analysis. Radioassays for gross beta and gamma activity were conducted, and in addition radiochemical determinations of individual fission products and induced activities were made. Data are tabulated. An evaluation is made of the potential hazard from the ingestion of contaminated materials. (C.H.)

12202

PERSISTENCE OF RADIOACTIVE CONTAMINATION IN ANIMALS OF MARSHALL ISLANDS TWO YEARS AFTER OPERATION CASTLE. S. H. Cohn (U. S. Naval Radiological Defense Lab., San Francisco). pp. 211-18 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

Data are summarized on the residual radioactive contamination in the tissues of 85 fish and marine invertebrates collected from the various lagoons of the Marshall Islands 2 years after the thermonuclear explosion of March 1, 1954. (C.H.)

12203

PUBLIC HEALTH IMPLICATIONS OF SHORT TERM HAZARDS. J. G. Terrill, Jr. (U. S. Public Health Service, Washington). pp. 219-21 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

Public health aspects of radiation injuries due to nuclear weapons tests or radiological warfare are briefly discussed. (C.H.)

12204

FALL OUT. RADIATION HAZARDS FROM NUCLEAR EXPLOSIONS. Revised edition including a report on the Windscale Disaster and an analysis of the United States Congress report on Radioactive Fall Out and its effects in Man. A. Pirie, ed. London, MacGibbon and Kee, 1958. 176p.

Problems associated with radiation hazards due to fall-out resulting from nuclear weapons testing are reviewed. (C.H.)

Radiotherapy

12205

IONIZATION BUILD-UP IN UPPER RESPIRATORY AIR PASSAGES DURING TELETHERAPY WITH COBALT 60 RADIATION. E. R. Epp, M. N. Lougheed, and J. W. McKay (Montreal General Hospital, Montreal, Can.). Brit. J. Radiol. 31, 361-7(1958) July.

An investigation of the status of electron equilibrium at the surface of a lesion located in an air cavity of the upper respiratory system irradiated with cobalt 60 teletherapy has been carried out. The experimental method consisted of measuring the build-up of ionization in a small ionization chamber in a masonite phantom. This phantom had an air volume in the shape of a rectangular

parallelepiped constructed so that its dimensions could be varied to cover the anatomical range. The photon beam passed through this air volume before reaching the ionization chamber. The departure of the reciprocal of the ionization build-up ratio $(BUR)^{-1}$ from unity was measured as the dimensions of the irradiating field and of the parallelepiped were varied. For practical cases encountered in radiation therapy this departure is not greater than 10% but should be accounted for if allowances for increased beam penetration through air are made. (auth)

Toxicology Studies

Refer also to abstract 12146.

12206

REMOVAL OF INTERNALLY DEPOSITED PLUTONIUM. V. H. Smith (General Electric Co., Richland, Wash.). Nature 181, 1792-3(1958) June 28.

Diethylenetriamine pentaacetic acid proved superior to both zirconium citrate and ethylenediamine tetraacetic acid in the prevention of deposition of plutonium in mammalian systems and for the removal of plutonium after it has become fixed in the tissues. (C.H.)

Tracer Applications

12207

STUDIES ON THE SKELETAL TISSUES. 5. THE INFLUENCE OF AGE UPON THE DEGREE OF CALCIFICATION AND THE INCORPORATION OF ^{32}P IN BONE. S. M. Weidmann (Univ. of Leeds) and H. J. Rogers (National Inst. for Medical Research, London). Biochem. J. 69, 338-43(1958) July.

The degree of calcification (calcium/nitrogen ratio) of cortical bones in rabbits increases from about the fifth day of life and in the cat from about the ninth day of life. From the birth of kittens until they are 9 days old there is a continuous reduction in the degree of calcification. The calcification of the cancellous bone in rabbits remains approximately constant during the whole of growth, whereas in cats this bone becomes less calcified during growth. The amount of P^{32} incorporated during the 4 hr following administration declines throughout the growth of rabbits in both cancellous and cortical bone. In cats there is a maximum incorporation in both types of bone at an age of about 14 days. This maximum is more marked in the cancellous bone. In both cats and rabbits there is a very marked change during growth in the incorporation of P^{32} in the subperiosteal and endosteal layers of bone. The incorporation of P^{32} in the former layers declines throughout growth, whereas that in the latter layers reaches its maximum in the adult. (auth)

12208

THE EFFECT OF X RAYS UPON THE UPTAKE OF ^{32}P BY THE KNEE JOINT OF THE MOUSE. RELATION BETWEEN THE DEPRESSION OF ^{32}P UPTAKE AND THE AGE OF ANIMAL. C. W. Wilson (Westminster Hospital, London). Brit. J. Radiol. 31, 384-6(1958) July.

The variation of radiosensitivity of the mouse knee joint with age of animal, as measured by depression of P^{32} uptake, is examined for animals between three and 20 weeks of age. The radiosensitivity falls continuously throughout this period, the radiosensitivity at three weeks being almost six times that at 20 weeks. The relation of these results to the growth rate and alkaline phosphatase activity of the mouse tibia is discussed. (auth)

12209

AUTORADIOGRAPHY OF NUCLEOLAR CONTENTS. J. L. Sirlin (Univ. of Edinburgh). Exptl. Cell Research 14, 447-53(1958) June.

Some observations on the proteins and nucleic acids of nucleoli, gathered with high resolution autoradiography, are presented. (auth)

12210

SITES OF NUCLEIC ACID SYNTHESIS IN THE MOUSE VISUALIZED BY RADIOAUTOGRAPHY AFTER ADMINISTRATION OF C^{14}-LABELLED ADENINE AND THYMIDINE. E. E. Walker and C. P. Leblond (McGill Univ., Montreal, Can.). Exptl. Cell Research 14, 510-31(1958) June.

A detailed radioautographic study was made of tissues taken from mice at 8, 24, and 72 hours after adenine-8-C^{14} injection. Newborn mice killed 8 hours after adenine-C^{14} injection and a 12-g mouse killed 24 hours after thymidine-C^{14} injection were also studied. The sites of incorporation of radioactivity after adenine-C^{14} injection were studied in radioautographs of slides with or without ribonuclease treatment. (auth)

12211

PTERIDINES IN PHOTOSYNTHESIS—AN ARTIFACT OF PAPER CHROMATOGRAPHY. R. C. Fuller, I. C. Anderson, and H. A. Nathan (Brookhaven National Lab., Upton, N. Y.). Proc. Natl. Acad. Sci. U. S. 44, 518-19 (1958) June.

The presence of the short-term C^{14}-labeled fluorescent compound in photosynthesis previously reported as a pteridine was determined to be a result of the technique employed in the experiments and not a metabolic reality in photosynthesis. (C.H.)

12212

METABOLISM OF CESIUM-137 IN THE RAT: COMPARISON OF ACUTE AND CHRONIC ADMINISTRATION EXPERIMENTS. John E. Ballou and Roy C. Thompson (General Electric Co., Richland, Wash.). Health Phys. 1, 85-9(1958) June.

Data were obtained for the retention of Cs^{137} in the rat over a period of 200 days following a single administration; and data showing the buildup of Cs^{137} during a period of 300 days of chronic feeding. Predictions of the chronic buildup results, based on the single administration data, were in close agreement with the results of the chronic feeding experiment. The highest equilibrium Cs^{137} concentration was observed in muscle. Retention of cesium in muscle was closely approximated by a single exponential function with a biological half-life of 13 days. There was no evidence, in any tissue, for retention of Cs^{137} with a half-life longer than 17 days. (auth)

12213

UPTAKE OF IODINE-131 IN HUMAN AND BOVINE THYROIDS FOLLOWING DETONATION OF NUCLEAR WEAPONS. Margaret R. White and Hardin B. Jones (Univ. of California, Berkeley). pp. 161-4 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

One hundred and fifty-one human thyroids and 1,000 beef thyroids were assayed for iodine-131 content between October 1955 and October 1956. Evidence of a prompt rise in thyroid radioactivity following nuclear explosions led to the conclusion that beef and human thyroids are in rapid equilibrium with iodine fall-out. (C.H.)

12214

THE EXCRETION OF RADIOACTIVE FISSION FRAGMENTS BY MAN DURING CONTINENTAL AND OVERSEAS WEAPONS TESTS. Ariel G. Schrodt, James B. Hartgering, and Kent T. Woodward (Walter Reed Army Inst. of Research, Washington). pp. 165-72 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

The excretion of iodine-131 and strontium-90 was measured by analysis of human urine specimens collected on a routine basis at selected stations throughout the United States and in foreign countries. The relationship of the excretion pattern to nuclear weapons tests and the proximity of atomic clouds is discussed. (C.H.)

CHEMISTRY

12215 ANL-4469(Del. 2)

Argonne National Lab., Lemont, Ill.

CHEMISTRY DIVISION, SECTION C-I, SUMMARY REPORT FOR JANUARY, FEBRUARY AND MARCH 1950. D. W. Osborne, ed. June 7, 1950. Decl. with deletions Dec. 2, 1957. 63p. Contract W-31-109-eng-38. $10.50 (ph OTS); $3.90(mf OTS).

Information is presented in three main sections: nuclear and radiochemistry, physical and organic chemistry, and process chemistry. Included is an investigation of naturally occurring Pu for isotopes other than Pu^{239}, an examination of Mallinckrodt wastes for Ac^{227}, the half life of Pa^{240}, the cross section of Np^{237} and a study of Np isomers, studies of various Tc and Re compounds, coincidence of interference in a pulse analyzer, absorption of neutrons in a sphere, separation of tritium and hydrogen, spectrophotometric studies of Pa, studies of salt-mixed solvent systems, spectra of ferric complexes, separation of Pu and Np, oxidation of Np(IV) by Fe(III), magnetic susceptibilities of actinic compounds, Np(V) compounds, thermal decomposition of UO_3, physical properties of metal chloride–phosphorus oxychloride systems, a continuous chromatographic adsorption method, fluoride volatility separations, fluorination of Th, Zr, Al, and Zr–U alloys, electrolysis of BrF_3 solutions, decontamination studies including U–Te separations, Pa volatility experiments, extraction of ionium from Mallinckrodt raffinate, and isolation of Pa from the ionium waste stream. (J.R.D.)

12216 BMI-1270

Battelle Memorial Inst., Columbus, Ohio.

THE NITRIC–HYDROFLUORIC ACID PICKLING OF ZIRCALOY-2. E. Burt Friedl, Warren E. Berry, Paul D. Miller, and Frederick W. Fink. June 11, 1958. 36p. Contract W-7405-eng-92.

$HF–HNO_3$ pickling solutions for Zircaloy-2 were studied. Acid concentration, bath contamination, and temperature were the parameters investigated. Pickling rates were found to be linear with time. Pickling rates increased linearly with the HF concentration, but variations in the HNO_3 concentration had little or no effect on the rate. Contamination of the bath with metal ions found in Zircaloy-2 at concentrations below saturation also had little or no effect on the pickling rate. Temperature-dependency studies in the range of 40 to 160°F indicated an activation energy of 4.95 kcal per mole for the dissolution of Zircaloy-2 in $HF–HNO_3$. The surface appearance of the Zircaloy-2 used in the study was found to be dependent upon both the HF and HNO_3 concentrations. (auth)

12217 CEA-726

France. Commissariat à l'Énergie Atomique, Paris.

ETUDE DES EFFETS ISOTOPIQUES DANS LA RÉDUCTION DU GAZ CARBONIQUE PAR LE ZINC. (A Study on the Isotope Effects in the Reduction of Carbon Dioxide by Zinc.) Marjan Senegačnik. 1957. 82p. Thesis submitted to Univ. of Paris.

The isotope effects which occur in the reduction of carbon dioxide by zinc were determined. It was shown that in the case of irreversible surface reactions, Bernstein's equation which permits the calculation of the fractionation factor is still valid. These experimental factors are in good agreement with those obtained by calculating the partition functions of the adsorbed activated complexes. In the reaction mechanism used, the model of the activated complex corresponds to the dissociation of one of the carbon oxygen bonds $CO_2 \rightarrow CO + O$. Perturbations arising from the slight reversibility of the reaction $Zn + CO_2 \rightleftharpoons ZnO + CO$ on the isotope effects on the carbon and oxygen atoms were also calculated. (auth)

12218 HW-55460

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

CONDITIONS FOR THE HYDRIDING OF ZIRCONIUM AND ZIRCALOY. AN INTERPRETIVE LITERATURE SURVEY. D. W. Shannon. Apr. 7, 1958. Decl. June 19, 1958. 35p. Contract W-31-109-Eng-52. $6.30 (ph OTS); $3.00(mf OTS).

A critical review was made of the literature available at Hanford Atomic Products Operation up to March 25, 1958, on the hydriding of zirconium and its alloys. A number of failures of zirconium and Zircaloy tubes and fuel element jackets are described. An hypothesis is set forth on the necessary conditions for hydriding of zirconium and its alloys. This hypothesis is necessarily based on secondary interpretation of experiments largely designed for other purposes, and is subject to modification as more direct experiments are completed. Conclusions drawn from this hypothesis should be considered as probabilities, and not as proven facts. One such conclusion is that circumstances exist where the use of Zircaloy jackets and tubes with uranium metal fuel elements could lead to hydrogen embrittlement of the Zircaloy. Uranium metal reacts with water to form considerable quantities of hydrogen. Under the proper conditions Zircaloy can pick up this hydrogen. Hydrogen concentrations greater than 100 ppm in Zircaloy start to cause hydrogen embrittlement, and very high concentrations can cause loss of all useful mechanical properties. High hydrogen contents can also impair the corrosion resistance of the metal to hot water. Water apparently inhibits the hydriding of Zircaloy and this certainly reduces the possibility of hydriding damage in a water cooled system. However, uranium metal is an excellent dehydrating agent. Thus, dry hydrogen can form and be picked up by the Zircaloy. Once the conditions necessary for hydriding are clearly understood, it should be possible to design the fuel elements and cooling system so that hydriding probabilities are minimized. (auth) 50 references.

12219 NP-6813

Convair Scientific Research Lab., San Diego, Calif.

CHEMICAL KINETICS BY NUCLEAR MAGNETIC RESONANCE. Research Report No. 3. Orlo E. Myers. June 15, 1958. 64p.

Magnetic resonance phenomena are described and the

derivation of the Bloch equations as modified by chemical reaction is presented. The determination of chemical lifetimes from line-shape measurement using phase detection is treated mathematically. On the basis of a simple bimolecular mechanism, the rate constants for the forward and reverse reactions of the triiodide equilibrium at about 35°C are $(5.4 \pm 0.4) \times 10^{10}$ l/mole-sec and $(1.0 \pm 0.1) \times 10^{8}$ sec^{-1} in the concentration ranges which have been investigated. The tribromide reaction is a hundred times slower in the forward direction but the stability of the tribromide ion is nearly the same as that of triiodide. (auth)

12220 NP-6814

Illinois. Univ., Urbana.
ELECTRODE POTENTIALS IN MOLTEN LITHIUM CHLORIDE–POTASSIUM CHLORIDE EUTECTIC. BEHAVIOR OF HALOGEN, IRON AND VANADIUM ELECTRODES. (thesis). Technical Report No. 5 J. W. Pankey. June 15, 1958. 53p. Project No. 1486. Contract DA-11-022-ORD-1987.

An investigation was made of electrochemistry in molten potassium chloride–lithium chloride eutectic. This eutectic is composed of 41 mole % potassium chloride and 59 mole % lithium chloride. It melts at 352°C. In addition to the comparatively low melting point, other advantages of this solvent are neutral acidity, low specific resistance, low viscosity, and broad span of electrolytic decomposition potential. The components are commercially available as reagent grade salts and Pyrex glass can be used as a material of construction. The disadvantage of this solvent is the hygroscopic nature of lithium chloride. Fundamental to electrochemical investigations is the establishment of electrode potentials. The electrodes studied in this research were the halogen, halide ion electrodes, and iron and vanadium electrodes. (auth)

12221 WAPD-BT-7

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
BETTIS TECHNICAL REVIEW. REACTOR CHEMISTRY AND PLANT MATERIALS. Mar. 1958. 159p. Contract AT-11-1-GEN-14 and appropriate NObs-Contracts. $3.00(OTS).

An extended series of dynamic tests of clad-and-defected pre-irradiated specimens of U–Mo alloy and UO_2 fuel materials was carried out in out-of-pile loops. The series of tests contrasted the major differences in the behavior of alloy and oxide fuel material during failure of fuel elements. Corrosion tests of bare, cold-pressed, and sintered UO_2 pellets have indicated that high oxygen concentrations in the coolant at operating temperatures will result in oxidation of exposed UO_2 at neutral, high, or low pH conditions. Out-of-pile tests were run to determine the extent of deterioration and contamination resulting from the effect of oxygenated water (600°F) on clad, defected PWR fuel elements. Van de Graaff studies were undertaken to determine what variables are involved in the phenomenon of preferential deposition of crud on fuel element surfaces. From experiments it is concluded that neither surface finish nor galvanic coupling has any appreciable effect on corrosion resistance of carbon steel under reactor operating conditions. Corrosion of shield tank materials (carbon steel, copper, and lead) was investigated in an inhibiting solution of lithium chromate. Results indicate that the solution is effective for at least six months. Montmorillonite clay was considered as a possible means of decontaminating waste liquors from PWR. Bench-scale experiments were run with simulated waste liquors which were treated in a small clay column. The clay will not remove, by exchange, all types of products and its use appears to be limited. In the event of a primary system leak in PWR, an efficient means for removing radioiodine from the plant container air is required. Chemical Warfare Service and filter-type air monitors were found to be approximately 90% effective in this application. An analytical train was designed to measure properties of the primary coolant water in PWR. The design and testing of the prototype is described. Testing proved the assembly to be satisfactory. Test data have been accumulated on a new instrumental method for measuring the concentration of hydrogen gas dissolved in water. The method is based on the fact that the electrical resistance of palladium metal is changed when in contact with water containing dissolved hydrogen. An investigation was made to determine whether nitric acid cleaning of sensitized type 304 stainless steel results in intergranular attack. The magnetic induction behavior of AISI types 410, 405, and 430 and 17-4 PH and AM 355 stainless steels in several heat-treated conditions was studied. A standard cutting machine, designed to open seal weld closures of control rod drive mechanisms and fuel ports, has been designed to meet rigid space requirements and still retain adaptability features. This cutter is composed of three standard components: the power package, the drive head, and the torque tube. The Central Technical Activities autoclave facility is responsible for much of the actual corrosion, wear, and friction testing done on reactor materials and components. A general description of the laboratory, its equipment, and its function is given. (See also WAPD-BT-3.) (W.D.M.)

12222 AEC-tr-3267

CATALYSIS OF SEMICONDUCTORS—THE CATALYTIC PROPERTIES OF METALLIC GERMANIUM. O. V. Krylov, S. Z. Roginskii, and V. M. Frolov. Translation prepared by the Oak Ridge National Lab. Library Staff from Doklady Akad. Nauk S.S.S.R. 111, 623-5(1956). 6p.

The basic experiments were carried out with a crystalline powder obtained by crushing a monocrystalline Ge sample in an agate mortar. Since the semiconductors of other chemical types are typical catalysts of reactions of an oxide-reducing type, Ge was tested as a catalyst of model reactions of this type. All the experiments with Ge were performed in a quartz reactor, connected with a vacuum system. The weighed portion was 2 grams and the Kr surface was 200 cm^2/g. (auth)

12223 AEC-tr-3308

PHASE DIAGRAM OF THE ALUMINUM OXIDE–WATER SYSTEM. K. Torkar and H. Worel. Translated by K. S. Bevis for Savannah River Lab. from Monatsh. Chem. 88, 739-48(1957). 10p.

The phase diagram Al_2O_3–H_2O was calculated from thermochemical data. Comparison with diagrams from other sources are made and discussed. (T.R.H.)

12224 AERE-Lib/Trans-781(MS 1 and 2)

HYDROGEN EXCHANGE BETWEEN AROMATIC HYDROCARBONS AND LIQUID DEUTERIUM BROMIDE. A. I. Shatenshtein, V. R. Kalinechenko, and Ya. M. Varshavskii. Translated by R. C. Murray (U.K.A.E.A., Atomic Energy Research Establishment) from Zhur. Fiz. Khim. 30, 2093-7(1956). HYDROGEN EXCHANGE BETWEEN BENZENE AND NAPHTHALENE DERIVATIVES AND LIQUID DEUTERIUM BROMIDE. ibid. 2098-2105. 19p.

The rate of hydrogen exchange between liquid deuterium bromide and aromatic hydrocarbons with condensed and uncondensed rings (benzene, naphthalene, phenanthrene, anthracene, pyrene, diphenyl, and p-

terphenyl) has been measured and the results compared with information exchange in liquid deuteroammonia with potassium catalysis. (auth)

12225

ON THE VOLATILITY OF POLONIUM COMPOUNDS. Hisao Mabuchi (Univ. of Tokyo, Hongo). Bull. Chem. Soc. Japan 31, 245-6(1958) Mar.

To determine whether the sublimation of polonium dithizonate is characteristic of dithizonate, the volatility of polonium compounds with other organic reagents and polonium compounds extracted in the absence of organic reagents was investigated. (T.R.H.)

12226

THERMODYNAMIC PROPERTIES OF LITHIUM FLUORIDE. N. K. Voskresenskaya, V. A. Sokolov, Ye. I. Banashek, and N. Ye. Shmidt. Izvest. Sektora Fiz. Khim. Anal. Inst. Obshchei Neorg. Khim. Akad. Nauk S.S.S.R. 233-8(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8993.)

The specific heat C_p of crystalline LiF is determined in the temperature range from 317 to 658°K using a method previously described (V. A. Sokolov, Zhur. Tekh. Fiz. 18, 813(1948)). The data obtained fit, within an average error of 0.25%, the relation C_p (cal/° mol) = $10.32 + 3.90 \times 10^{-3} T - 1.36 \times 10^{+5} \times T^{-2}$. A measurement was made of the enthalpy of LiF in the interval 673 to 1410°K. The results are expressed by the equations: $H_T - H_{293.16}$(cal/mol) = $10.00 T + 2.217 \times 10^{-3} T^2 + 122176 T - 3539$ (solid phase) and $H_T - H_{293.16} = 32 + 15.175 T$ (1128 to 1410°K; liquid phase). ΔH_m = 6477, ΔS_m = 5.78 entropy units. The standard values are: $H_{298.16}$ = 1548 cal/mol and $S_{298.16}$ = 8.53 entropy units. The values of C_p, H, S, and Z are calculated in the range 50 to 1400°K and tabulated.

12227

MECHANISMS OF EXCHANGE REACTIONS BETWEEN ELEMENTARY IODINE AND AROMATIC IODIDES. Samuel Levine and Richard M. Noyes (Columbia Univ., New York). J. Am. Chem. Soc. 80, 2401-9(1958) May 20.

The thermal exchange of elementary iodine with iodobenzene and with p-nitroiodobenzene has been studied in the solvents hexachlorobutadiene-1,3 and nitrobenzene. Two independent processes contribute to the rate. One process is the expected direct radical exchange between an iodine atom and a molecule of aromatic iodide. The rate constants for this process are not significantly affected by change of solvent, but substitution with a p-nitro group slows the rate somewhat. This effect of substitution is opposite to the direction usually predicted and observed for radical reactions. The other exchange process is second order in aromatic iodide and is usually zero order in iodine. Change of solvent from hexachlorobutadiene to nitrobenzene inhibits this process for iodobenzene but accelerates it for p-nitroiodobenzene. When both aromatic iodides are present in a solution, the rate constant for the exchange process involving one molecule of each is greater than the rate constant for either process involving two identical molecules. We propose that this exchange process involves reversible formation of a diphenyliodonium iodide ion pair and rapid exchange of molecular iodine with the iodide portion of it. The proposed mechanism explains some peculiar observations reported previously on the exchange of iodobenzenes with sodium iodide. These aromatic iodides also decompose with formation of molecular iodine. The rates are erratic but seem to follow first-order kinetics when only one aromatic iodide is present. If both iodobenzene and p-nitroiodobenzene are present, an additional decomposition is ascribed to rearrangement of the diphenyliodonium iodide ion pair to form iodine and a monosubstituted diphenyl. (auth)

12228

RATE CONSTANTS FOR COMBINATION OF IODINE ATOMS IN INERT SOLVENTS. Howard Rosman and Richard M. Noyes (Columbia Univ., New York). J. Am. Chem. Soc. 80, 2410-15(1958) May 20.

The effect of intermittent light on the rate of a chain reaction involving iodine atoms has been used to measure the average life-time of photochemically produced iodine atoms between about 15 and 35° in hexane, carbon tetrachloride and hexachlorobutadiene-1,3. Since quantum yields for iodine dissociation previously had been measured by a scavenger technique in the same solvents at the same temperatures, the data can be used to calculate rate constants for the combination of "old" iodine atoms that have escaped their original partners. The rate constants are all about 5×10^9 liter/mole sec or greater and are in good agreement with the magnitudes to be expected if the rate of the combination reaction is determined by the rate of diffusion of atoms together. However, the data fail to support the proportionality between viscosity and diffusion coefficient predicted by hydrodynamic theories. Measurements in several laboratories of photostationary atom concentration, life-time, quantum yield and rate constant are all remarkably consistent with each other. Both lifetime measurements with intermittent light and rate constant measurements with flash photolysis offer advantages under certain conditions. (auth)

12229

MICROWAVE EXCITATION AS A SYNTHETIC TOOL: THE PREPARATION OF DIBORON TETRACHLORIDE. Jack W. Frazer and R. T. Holzmann (Univ. of California, Livermore). J. Am. Chem. Soc. 80, 2907-8(1958) June 5.

Diboron tetrachloride was prepared by microwave excitation of gaseous boron trichloride at less than 4 mm pressure. Various parameters which may increase the concentration of the active species and at the same time inhibit recombination of chlorine with diboron tetrachloride are under investigation. (J.R.D.)

12230

SOME THERMAL REACTIONS OF PERFLUOROALKYL DERIVATIVES OF SF_6 WITH FLUOROCARBON OLEFINS. R. D. Dresdner, T. J. Mao, and J. A. Young (Univ. of Florida, Gainesville). J. Am. Chem. Soc. 80, 3007-9(1958) June 20.

Thermal reactions between the reactants (A) $(CF_3)_2SF_4$ and $CF_3CF=CF_2$ and (B) CF_3SF_5 and $CF_3C\equiv CCF_3$ were carried out at atmospheric pressure and slightly above 500° in a flow system. In reaction A the major products by weight were a mixture of C_5F_{12} isomers from which a rather pure sample of neo-C_5F_{12} was isolated. Some of its properties and its infrared assignments are given. In reaction B, the only isolable products were the compounds perfluoro-2,3,4-trimethylhexadiene-2,4 and perfluoro-2,3,4,5-tetramethylhexadiene-2,4. Some of the chemical and physical properties of these new dienes are presented. (auth)

12231

THE DEUTERIUM ISOTOPE EFFECT IN THE SIDE CHAIN HALOGENATION OF TOLUENE. Kenneth B. Wiberg and Lynn H. Slaugh (Univ. of Washington, Seattle). J. Am. Chem. Soc. 80, 3033-9(1958) June 20.

The intramolecular deuterium isotope effect obtained in the side chain halogenation of toluene and some of its derivatives has been determined. Factors which decreased the energy of activation decrease the isotope effect. This observation may be interpreted by a consideration of the potential energy curves for the dissociation of reactants and products. The magnitude of the isotope effect is used as a criterion in considering the mechanisms of some halogenation reactions. (auth)

12232

A MASS SPECTROMETRIC APPEARANCE POTENTIAL STUDY OF ISOTOPICALLY LABELED DIBORANES. W. S. Koski, Joyce J. Kaufman, C. F. Pachucki, and F. J. Shipko (Johns Hopkins Univ., Baltimore and Knolls Atomic Power Lab., Schenectady, N. Y.). J. Am. Chem. Soc. 80, 3202-7(1958) July 5.

The appearance potentials of the molecule ions formed by electron impact from B_2H_6, $B^{10}{}_2H_6$, B_2D_6 and $B^{10}{}_2D_6$ have been measured mass spectrometrically. A set of apparently self-consistent ionization potentials for these molecule ions has been estimated from the appearance potentials of the B^{10} enriched compounds. The resulting calculated ionization potentials for the fragments from $B^{10}{}_2H_6$ are compared with the ionization potentials the authors estimate for fragments from $B^{10}{}_2D_6$ and are also compared with the results obtained from C_2H_6. The mass spectra of B_2H_6, $B^{10}{}_2H_6$, B_2D_6 and $B^{10}{}_2D_6$ were also run at 70 ev ionizing voltage in order to obtain a set of fragmentation patterns of the isotopically labeled diboranes under identical conditions; from these the monoisotopic spectrum of each type of diborane was calculated. (auth)

12233

ION EXCHANGE STUDIES OF TRANSGUANYLATION REACTIONS. II. REARRANGEMENT OF 3-AMINOPROPYLISOTHIOUREA AND N-SUBSTITUTED AMINOETHYL- AND AMINOPROPYLISOTHIOUREAS TO MERCAPTOALKYLGUANIDINES AND 2-AMINOTHIAZOLINES OR PENTHIAZOLINES. Joseph X. Khym, David G. Doherty, and Raymond Shapira (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 80, 3342-9(1958) July 5.

Quantitative ion-exchange chromatography was used to establish that intratransguanylation is dependent on pH as well as on the number of carbon atoms between the amino and isothiourea groups. The aminoethyl- and aminopropylisothioureas intratransguanylate readily at neutral pH but S,4-aminobutylisothiourea does not. At pH's 3–6, 2-aminothiazolines and -penthiazolines are formed, whereas in strong alkali, mixtures of mercaptoguanidines and mercaptoamines are formed. N-Alkyl substitution on the various N atoms alters the pH at which intratransguanylation takes place as well as the rate of formation and composition of the products obtained. (auth)

12234

ORGANOBORON COMPOUNDS. X. MIXED TRIALKYLBORANES DISTILLABLE WITHOUT DISPROPORTIONATION. G. F. Hennion, P. A. McCusker, and J. V. Marra (Univ. of Notre Dame, Ind.). J. Am. Chem. Soc. 80, 3481-2(1958) July 5.

The preparation and properties of t-butyl-isobutyl-n-amylborane and t-butyl-di-n-amylborane (distillable without disproportionation) are given. (T.R.H.)

12235

ELECTRON SPIN RESONANCE OF N^{15}-NITROBENZENE NEGATIVE ION. Raymond L. Ward and Melvin P. Klein (Univ. of California, Livermore). J. Chem. Phys. 28, 518-19(1958) Mar.

The electron spin resonance of N^{15}-nitrobenzene negative ion was observed. N^{14}-nitrobenzene negative ion in solution, about 10^{-3} molar, yields a hyperfine pattern of 10 lines extended over a range of 42.6 gauss. The spectrum was calculated by a spin Hamiltonian with appropriate choices of coupling constants which were verified by preparing benzene containing 64 at.% N^{15}. (J.R.D.)

12236

KINETIC STUDIES OF HYDROXYL RADICALS IN SHOCK WAVES. I. THE DECOMPOSITION OF WATER BETWEEN 2400° AND 3200°K. S. H. Bauer (Cornell Univ., Ithaca, N. Y.) and G. L. Schott and R. E. Duff (Los Alamos Scientific Lab., N. Mex.). J. Chem. Phys. 28, 1089-96(1958) June.

The decomposition of water vapor has been studied at temperatures between 2400 and 3200°K generated in plane shock waves by following changes in the concentration of OH with time. Specific radiation absorbimetry permits these measurements to be made with microsecond resolution. The source of OH radiation used was a flash lamp containing water vapor. Measurements were made on the gas behind reflected shock waves in argon at initial pressures near 50 mm Hg and containing the reactant, H_2O vapor, in amounts of the order of 1 mole %. The shock tube and associated electronic and optical equipment are described. Problems of purity, chemical analysis, and reduction of data are discussed. Absorption by OH was calibrated with the equilibrium mixtures resulting from the decomposition of H_2O and from the reaction of H_2 and O_2. The rate of formation of OH from H_2O is proportional to the H_2O concentration and nearly independent of the argon pressure. The effective activation energy is about 50 kcal/mole. Addition of 2% O_2 to the mixture approximately doubles the rate of OH formation and preserves the 50 kcal activation energy. Addition of 2% H_2 decreases the rate and increases the activation energy to about 80 kcal/mole. Possible reaction mechanisms are considered. The initial rate of appearance of OH cannot be interpreted in terms of the simple dissociation of H_2O into H and OH, and it seems necessary to consider a relatively low-energy path involving H_2O_2 or the HO_2 radical as an intermediate. (auth)

12237

HYDROGEN-DEUTERIUM EXCHANGE REACTION IN α-KERATIN. R. D. B. Fraser and T. P. MacRae (Wool Textile Research Labs., C. S. I. R. O., Melbourne). J. Chem. Phys. 28, 1120-5(1958) June.

A quantitative study of the hydrogen → deuterium exchange reaction in α-keratin by means of infrared spectra showed that after 50 hr at 30°C about 30% of the peptide linkages had not reacted. Observations between 50 and 1000 hr failed to detect any further reaction but elevation of pD or temperature caused additional exchange. Evidence is presented which suggests that the unreactive peptide linkages occur in the organized regions of the structure (microfibrils) and that complete exchange of the replaceable hydrogen atoms in the side-chains takes place. (auth)

12238

APPLICATION OF A HIGH-SPEED ELECTRONIC COMPUTER IN DIFFUSION KINETICS. Donald A. Flanders and Hugo Fricke (Argonne National Lab., Lemont, Ill.). J. Chem. Phys. 28, 1126-9(1958) June.

The Argonne electronic computer AVIDAC is applied in the numerical solution of $\partial n/\partial t = \nabla^2 n - k_1 n^2 - k_2 n$, which, with suitable boundary and initial conditions, represents the reaction kinetics of the one-radical

model used earlier by Fricke to describe the track effect in the radiation chemistry of a solution of a single solute. The fractional number of radicals combining with solute molecules is computed in terms of two dimensionless parameters that completely define the problem. Comparison with the formulas derived by using Jaffé's approximation method shows in most cases agreement to within 10% (though in some extreme cases only to within 50% to 80%), which indicates that Jaffé's method should give useful results in developing other aspects of diffusion kinetics. (auth)

12239

KINETICS OF THE HIGH-TEMPERATURE HETEROGENEOUS REACTION OF CHLORINE AND NICKEL BETWEEN 1200 AND 1700°K. John D. McKinley, Jr. and Kurt E. Shuler (National Bureau of Standards, Washington). J. Chem. Phys. 28, 1207-12(1958) June.

The kinetics of the reaction of gaseous chlorine with metallic nickel has been investigated in a constant pressure flow system in the temperature range from 1200 to 1700°K, and at chlorine pressures between 0.08 and 0.4 mm Hg. Nickel chloride produced in the overall reaction, $Ni_{(s)} + Cl_{2(g)} \rightarrow NiCl_{2(g)}$, is highly volatile at these temperatures, and the reaction thus takes place on the exposed metal surface. The process whereby nickel is removed from the surface is first order in chlorine pressure, very rapid with a collision efficiency between 0.5 and 0.2, and is temperature independent, i.e., $E_{act} < 2$ kcal. The rate constant for the removal of nickel is found to be 1.85×10^3 cm sec^{-1}, the units corresponding to moles of nickel per cm^2 of surface per unit density (M/cm^3) of chlorine. An experimental technique employing time lapse photography is described which is particularly well suited to the study of the kinetics of high temperature surface reactions with volatile reaction products. (auth)

12240

ABSORPTION AND DISPERSION OF SOUND IN CHEMICALLY REACTING FLUIDS. R. M. Mazo (Univ. of Chicago). J. Chem. Phys. 28, 1223-9(1958) June.

The hydrodynamic equations for a reacting fluid mixture, in the form given by Kirkwood and Crawford, are used to find the dispersion and absorption of plane infinitesimal sound waves. Only the case of no internal relaxation is treated. The equation for the absorption and dispersion is simplified for commonly occurring special cases, and it is shown that the viscothermal and chemical absorptions and dispersions are additive to first order. The effects of diffusion currents are estimated in the appendix and found to be negligible. (auth)

12241

HYDROLYSIS OF THE THORIUM ION Th^{4+}. Jean Lefebvre (Institut des Hautes Études, Tunis). J. chim. phys. 55, 227-33(1958) March. (In French)

The mechanism of hydrolysis of Th^{4+} ions can be explained by postulating in addition to the simple ions $Th(OH)_2^{2+}$ and $Th_2(OH)_2^{6+}$ the ion $Th_5(OH)_{12}^{6+}$ from the form of the potentiometric titration curve up to n = 2 (n = no. of molecules of NaOH complexed per Th atom). The stability of these ions has been determined: one of the first two is relatively weak, explaining why the Th^{4+} concentration does not begin to become negligible until $\bar{n} = 2.4$ (corresponding to complete formation of the pentacondensed ion). The concentration of free Th^{4+} ions is obtained without any accessory hypothesis by means of surface potentiometry. This latter also permits the determination of the total number of particles in solution and gives results in good agreement with those from cryoscopic measurements. (T.R.H.)

12242

THE KINETICS OF HYDROGEN-ISOTOPE EXCHANGE REACTIONS. PART VII. AROMATIC HYDROGEN EXCHANGE IN THE SOLVENT SYSTEMS $ZnCl_2-CH_3 \cdot CO_2H$ AND $ZnCl_2-HCl-CH_3 \cdot CO_2H$. D. P. N. Satchell (King's Coll., London). J. Chem. Soc. 1927-30(1958) May.

The rate of the acid catalyzed hydrogen-isotope exchange between p-deuteroanisole and the solvent systems $ZnCl_2-CH_3COOH$ and $ZnCl_2-HCl-CH_3COOH$ has been measured at 25°. The rate parallels, to a close approximation, the extent of ionization of indicators such as 4-chloro-2-nitroaniline and p-nitrodiphenylamine in these systems. The ionization process of these compounds is, therefore, considered to involve only hydrogen transfer. The details of the exchange mechanism are discussed. (auth)

12243

DEUTERIUM ISOTOPE AND SOLVENT EFFECTS IN THE BASE-CATALYZED KETO-ENOL TRANSFORMATIONS OF METHYLACETYLACETONE (3-METHYLPENTANE-2:4-DIONE). F. A. Long and D. Watson (University Coll., London). J. Chem. Soc. 2019-24 (1958) May.

The rates of bromination of methylacetylacetone (3-methylpentane-2:4-dione) and of its 3-deutero-analogue have been measured at 25° in water and D_2O with the basic catalysts water and acetate ion. When the solvent and catalyst are the same, the monodeuteroketone reacts about four-fold more slowly than the proton compound. With either of the catalysts the ratio of the rates of bromination of a given compound in the two solvents, k^H/k^D, is about 1·3. For acetate ion as catalyst this value must be due to a pure solvent effect. If the same solvent effect enters for the water-catalyzed reaction one can conclude that the base strengths of H_2O and D_2O are the same. Data on the keto–enol equilibrium for the two solvents permit calculations of the rates of the reverse, ketonization reactions. Since the mechanism of this reverse reaction is known, one can also calculate rate ratios for the slow acid-catalyzed formation of ketone from the enolate ion. The interesting result is that the k^H/k^D ratio for catalysis by acetic acid is about 6. Combination of these and related data permits a detailed analysis of the acid-base properties of H_2O and D_2O and their ions. (auth)

12244

BARIUM–LITHIUM EQUILIBRIUM SYSTEM. Douglas V. Keller, Jr., Frank A. Kanda, and Aden J. King (Syracuse Univ., N. Y.). J. Phys. Chem. 62, 732-3 (1958) June.

The barium–lithium equilibrium system has been investigated in the liquid and solid state over the entire composition range. The liquidus and solidus curves were determined by thermal analysis. Barium (m.p. 725°) and lithium (m.p. 180.5°) form an intermediate phase, $BaLi_4$, which melts incongruently at 156°. $BaLi_4$ and lithium form a eutectic at 70 weight % barium which melts at 143°. No measurable solid solubilities were found in the system. The x-ray-diffraction pattern of $BaLi_4$ is in good agreement with a hexagonal cell having as its dimensions $a_0 = 10.92 \pm 0.01$ A. and $c_0 = 8.94 \pm 0.01$ A. with c/a = 0.818. The density was found to be 1.75 ± 0.05 g./cm.^{3} which requires a cell content of six molecules of $BaLi_4$. (auth)

12245

THE VALIDITY OF ONSAGER'S RECIPROCAL RELATIONS IN TERNARY DIFFUSION. Donald G. Miller (Univ. of California, Livermore). J. Phys. Chem. 62, 767(1958) June.

The validity of Onsager's reciprocal relations in ternary diffusion was verified by transformation of the thermodynamic expressions into concentration gradient form while assuming no volume flow. A table containing several systems is presented, and the estimated error is assigned solely to uncertainties in diffusion coefficients based on concentration gradients; however, some error undoubtedly exists in the activity coefficients since they were estimated in the absence of experimental data. (J.R.D.)

12246

STUDY OF FUSED SALTS AT ELEVATED TEMPERATURES BY X-RAY DIFFRACTION. II. STRUCTURE OF THE LIQUID STATE OF THE CHLORIDES LiCl, NaCl, KCl, $BaCl_2$ AND OF THE FLUORIDE CaF_2. GENERAL CONSIDERATIONS ON THE STRUCTURE OF FUSED HALOGENIDES. Jerzy Zarzycki (Centre de Recherches des Glaceries de Saint-Gobain, France). J. phys. radium 19, Suppl. No. 4, 13A-19A(1958) Apr. (In French)

The analysis of the radial distribution curves deduced by Fourier transform from the x-ray diffraction spectra of molten salts confirms the results already obtained for alkali fluorides. In the liquid state the low-range order of the crystal is conserved but the first coordination number is much lower. This proves the lacunar structure of molten halides. It is shown that the holes are actually "fluctuating cracks" between ionic clusters grouping 1-2 ionic shells around a central ion. (auth)

12247

ATOMIC AND FREE RADICAL REACTIONS. SECOND EDITION, VOLUMES I AND II. E. W. R. Steacie. American Chemical Society Monograph Series No. 125. New York, Reinhold Publishing Corp., 1954. 912p.

In the first half of the book a general discussion is given of experimental methods and the role of atoms and radicals in thermal and photochemical reactions. The last half is a systematic survey in which an attempt is made to discuss all data which have a bearing on the rates of individual elementary reactions. (W.L.H.)

Aerosols

12248 WADC-TN-58-58

Wright Air Development Center. Materials Lab., Wright-Patterson AFB, Ohio.

A SIMPLIFIED AIR SAMPLING METHOD. [Period covered] June 1957 to August 1957. Robert D. Thomas. Mar. 3, 1958. 16p. Project title: MATERIALS ANALYSIS AND EVALUATION TECHNIQUES. Task title: EFFECTS OF NUCLEAR RADIATION ON MATERIALS AND PROCESSES. (AD-155523).

A fast and efficient method of determining the radioactive particulate matter content of air is described. A comparison is made with the previous time consuming method to show the advantages of the new method. The method is unique for calibration since the counting system can be easily calibrated for any isotope to be used for comparison purposes. (auth)

Analytical Procedures

Refer also to abstract 12317.

12249 AERE-C/R-2407

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE MICRO VOLUMETRIC DETERMINATION OF URANIUM AND PLUTONIUM. J. L. Bunce. 1958. Date of MS. May 1951. Decl. May 1957. 26p. $0.72 (BIS).

Declassified version of AERE-C/R-717.

A method is described for the determination of U or Pu by reduction with liquid zinc amalgam and subsequent titration of the reduced solution with standard ceric sulfate. The determination may be carried out in about 1.5 hr, and results are reproducible to ±0.3%. Synthetic mixtures of Pu and U have also been successfully analyzed, although with a lower degree of accuracy. Some further investigation is required to establish the absolute accuracy of the method for Pu and to ascertain the effect of impurities other than Fe and U. (auth)

12250 AERE-Med/M-22

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

A PLATING BATH FOR POLONIUM. P. J. Gomm. Apr. 1958. 5p.

The apparatus described is an improvement on the existing plating bath for Po^{210}. The possibility of a leak is reduced to the absolute minimum, while the same degree of efficiency is maintained. The incorporation of compressed air as a means of stirring reduces the effective space required by the plating bath, enables safe overnight running, and requires no maintenance. (auth)

12251 IDO-14316(Suppl. 3)

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

SUPPLEMENT NO. 3 TO MANUAL OF THE ANALYTICAL METHODS USED BY THE CONTROL LABORATORY AT THE CHEMICAL PROCESSING PLANT. John H. Sikes and James E. Rein. TISE issuance date Oct. 1957. 100p. $2.75(OTS).

Six new and seven modified analytical methods are presented which bring up to date the basic report. The six new methods are: the determination of the oxygen demand of decomposable organic matter by biochemical action, a gravimetric method for aluminum, and colorimetric methods for boron, chromium, nickel, and ruthenium. The modified methods are: a pH titrimetric method for the determination of free acid or base in hydrolizable ion solutions, a turbidimetric determination for small amounts of chloride, a conductometric method for fluorides, colorimetric and titrimetric determinations of mercury, Kjeldahl determination of nitrates, and an amperometric determination of zirconium. (J.R.D.)

12252 KAPL-1890

Knolls Atomic Power Lab., Schenectady, N. Y.

THE DETERMINATION OF DISSOLVED ARGON IN WATER. E. L. Shirley, C. F. Pachucki, and L. K. Lolos. Nov. 19, 1957. 18p. Contract W-31-109-Eng-52. $0.50(OTS).

Dissolved argon in the primary coolant water of a nuclear reactor presents a problem of accessibility to the reactor at shutdown. Because of the production or radioactive Ar^{41} from the naturally occurring argon, it is desirable to limit the concentration of argon in the makeup water by some means of deaeration. Two methods for the analysis of dissolved argon at low concentrations are described. Both methods depend upon a mechanical separation of the dissolved gas from the water and an analysis of the separated gas by a General Electric mass spectrometer. Data are shown for

recoveries from standard samples which demonstrate a standard deviation of ± 0.02 ppm. (auth)

12253 NP-6800

Polish Academy of Sciences. Inst. of Nuclear Research, Warsaw.

EMISSIONS-SPEKTRALANALYTISCHE HESTIMMUNG VON BORIUMSPUREN IN GRAPHITEN, KOHLEN, KOKSEN UND RUSS (Emission Spectroscopic Determination of Boron Traces in Graphite, Coal, Coke, and Carbon Black.) Report No. 22/VIII. S. Held and S. Skalaka. May 1958. 14p.

A spectral determination of boron traces in graphite and carbon materials is presented. The method consists of two parts: (1) determination of the boron in graphite, coal, coke, and carbon black in a concentration range from 0.1 to 2 μg B/g of the sample after previous ashing with calcium hydroxide, and (2) determination of the boron in graphite in the concentration range from 0.5 to 8 μg B/g graphite without previous ashing of the sample. (J.S.R.)

12254 NP-6804

Polish Academy of Sciences. Inst. of Nuclear Research, Warsaw.

RADIOMETRIC ESTIMATION OF UNSATURATED FATTY ACIDS ON CHROMATOGRAMS. Report No. 26/V. A. Z. Budzyński, Z. J. Zubrzycki, and I. G. Campbell. May 1958. 6p.

A technique is considered for estimating amounts of fatty acids separated by partition paper chromatography, without necessity for time consuming elution, and free from inherent errors of strip photometry. Radiometric methods can meet these requirements, and in chromatographic applications have sometimes allowed accurate definition of spot geometry, which in some cases may be quantitatively related to spot content. (auth)

12255 ORNL-2489

Oak Ridge National Lab., Tenn.

THERMOMETRIC (ENTHALPYMETRIC) TITRATION OF FREE ACID IN THE PRESENCE OF CERTAIN HYDROLYZABLE IONS. Francis J. Miller and Paul F. Thomason. July 9, 1958. 35p. Contract W-7405-eng-26. $1.25(OTS).

The free acid is determined by titrating the sample solution with a standard base and recording the change in temperature. The plot of temperature vs. volume of titrant added is made automatically by a recording potentiometer. The end point of the titration is obtained by extrapolation of the straight-line portions of the curve. Systems studied were zirconium in hydrofluoric acid, uranyl ion in sulfuric acid and nitric acid, and thorium in nitric acid. (W.D.M.)

12256

ANALYSIS OF BISMUTH BASE ALLOYS. III. TERNARY ALLOYS CONTAINING URANIUM AND NEODYMIUM OR PRASEODYMIUM. G. W. C. Milner and J. W. Edwards (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Anal. Chim. Acta 18, 513-19 (1958) June.

Procedures are described for the analysis of bismuth-base alloys containing 0.2 to 5% of uranium and 0.2 to 5% of neodymium or praseodymium. Bismuth is first separated from a solution of the alloy in 1 N nitric acid by extraction with diethylammonium diethyldithiocarbamate in chloroform, followed by the separation of uranium with the same reagent from an acetate buffered solution of pH 5.5 to 6.0. The uranium determination is completed by measuring the absorbancy of its diethyldithiocarbamate complex in chloroform. The neodymium or praseodymium is determined by titration with EDTA of the aqueous solution remaining after the separation of bismuth and uranium, using xylenol orange indicator in solutions of pH 5.6 to 5.8. EDTA is also used to determine the bismuth by direct titration of a separate aliquot of the sample solutions. (auth)

12257

THE DETERMINATION OF MICROGRAM AND SUBMICROGRAM AMOUNTS OF BORON. II. THE SEPARATION OF BORON BY DISTILLATION AND THE EVAPORATION OF DISTILLATES. G. S. Spicer and J. D. H. Strickland (U. K. Atomic Energy Authority, Research Group, Woolwich Outstation, London). Anal. Chim. Acta 18, 523-33(1958) June.

Methyl alcohol distillates containing μg amounts of boron may be evaporated without loss of boron by first adding water, sodium hydroxide, and glycerol. The resulting residues can be used directly in the curcumin absorptiometric methods previously described. The distillation techniques developed over the last decade by the United Kingdom Atomic Energy authority are briefly described, as these can be used for the separation of boron from practically all types of sample, including organic matter after it has been ashed with lime. In all cases aqueous solutions of the samples are made slightly acid (pH 1.5 to 5) and evaporated nearly to dryness. Residues are then treated with methyl alcohol in one of three ways according to their properties. It is essential to use all-silica distillation apparatus and platinum dishes for collecting distillates. Notes are given of other precautions necessary to minimize contamination from reagents and other sources. The methods are rapid and suitable for routine analysis on up to 10 g of sample. Under favorable conditions, the limit of detection is of the order of 0.01 ppm of boron. A precision of better than 5% can be obtained with amounts exceeding about 0.2 ppm. (auth)

12258

THE DETERMINATION OF RUBIDIUM BY THE METHOD OF STABLE ISOTOPE DILUTION. A. A. Smales and R. K. Webster (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Anal. Chim. Acta 18, 582-6(1958) June.

The rubidium contents of a granite (G-1), a diabase (W-1), and sea-water have been determined by mass spectrometric isotope dilution analysis. The values found are: G-1, 214 ppm; W-1, 21.3 ppm; sea water, 121.4 μg/l. These results show excellent agreement with values obtained at Harwell by neutron activation analysis, and the coefficient of variation for four determinations is usually ±1 to 2%. Rubidium ions were produced in the mass spectrometer by either a side filament or a center filament technique. The former method enables rubidium and lithium determinations to be combined; the results obtained by the second method suggest that concentrations of the order of 1 ppm may be determined for a sample of only a few mg with little chemical treatment beyond that required to decompose the sample. (auth)

12259

THE DETERMINATION OF LITHIUM IN ROCKS BY THE METHOD OF STABLE ISOTOPE DILUTION. A. A. Smales and R. K. Webster (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Anal. Chim. Acta 18, 587-96(1958) June.

A method is described for the determination of lithium in rocks by the method of stable isotope dilution. About 50 to 500 mg of the sample are used for

each determination. The sample is mixed with a known quantity of enriched lithium and is then decomposed by a mixture of hydrofluoric and perchloric acids. The separation of the alkali metals from iron and aluminium is based on the thermal decomposition of the perchlorates. For mass spectrometric measurements it is not necessary to separate the lithium from the other alkali metals. The values obtained for the lithium contents of two standard rocks are: G-1, 21.3 ppm; W-1, 12.6 ppm. Independent determinations, made using both Li^6 and Li^7 as tracers, have established that no significant systematic errors are caused by isotopic fractionation. Results obtained for two clay samples containing 0.1 to 0.3% of lithium show good agreement with spectrographic values. (auth)

12260

THE POLAROGRAPHIC DETERMINATION OF INDIUM IN ZINC-BASE ALLOYS. II. THE DETERMINATION OF INDIUM IN ZINC AND IN ZINC ALLOYS OF LOW ALUMINIUM CONTENT. G. F. Reynolds and H. I. Shalgosky (Ministry of Supply, Royal Arsenal, Woolwich, Eng.). Anal. Chim. Acta 18, 607-11(1958) June.

Studies of the application of an 8-hydroxyquinoline extraction and of a zinc oxide "collection" procedure for the separation of trace amounts of indium from zinc alloys are described and discussed. A combination of radiochemical and polarographic determinations were employed for this work. A polarographic method for the determination of indium in zinc and in zinc alloys of low aluminum content is presented. (auth)

12261

THE POLAROGRAPHIC DETERMINATION OF ALUMINUM. I. GENERAL INTRODUCTION. POLAROGRAPHY OF SOLOCHROME VIOLET R.S. IN THE PRESENCE OF ALUMINUM. M. Perkins and G. F. Reynolds (Ministry of Supply, Woolwich, Eng.). Anal. Chim. Acta 18, 616-24(1958) June.

A survey is made of the methods available for the determination of microgram quantities of aluminum, together with techniques for its separation from interfering ion species. The polarography of aluminum is briefly discussed and a study is reported of a method involving the modification, by this element, of the polarographic characteristics of a diortho-hydroxy azo dye. Interferences from other elements are given in detail and discussed. Means for their removal are suggested. (auth)

12262

THE POLAROGRAPHIC DETERMINATION OF ALUMINIUM. II. THE DETERMINATION OF MICROGRAM AMOUNTS OF ALUMINUM IN BERYLLIUM METAL. M. Perkins and G. F. Reynolds (Ministry of Supply, Woolwich, Eng.). Anal. Chim. Acta 18, 625-31(1958) June.

A description is given of the application of the polarographic determination of aluminum using solochrome violet R.S. to the determination of microgram amounts of this element in beryllium metal. The method involves the removal of the aluminum from the bulk of the beryllium and from certain other elements by extraction with 8-hydroxyquinoline into chloroform. After destruction of the oxinate and removal of iron and other interfering elements still remaining, by mercury cathode electrolysis, the aluminum is determined polarographically. Results are presented and some theoretical aspects are discussed. (auth)

12263

A METHOD FOR THE DETERMINATION OF IONIUM. I. Ye. Starik, A. S. Starik, G. S. Lozhkina, and L. V. Talitskaya (Academy of Sciences, USSR). Byull. komis. po Opredel. Absolyut. Vozrast. Geol. Form. Akad. Nauk S.S.S.R. 1, 47-52(1955). (Translated from Referat. Zhur. Khim. No. 1, 1957, Abstract No. 1234.)

After dissolution of the resin in HNO_3 the Th isotopes are deposited on Ce (carrier) as the oxalates. Pb^{210}, Bi^{210}, and Po are separated by electrolysis in 1N HNO_3 by passing a 100-ma, 2.1-v current through the solution for 9 hours. Th^{234} is used as an indicator for the completeness of Io (Th^{230}) separation. It was established that: (1) complete removal of Ra and U is achieved by double deposition of Ce(Io) oxalate; (2) the deposit of Ce oxalate after double deposition adsorbs 7 to 12% Po, >30% Bi^{210}, and 2 to 3% Pb^{210}; and (3) when H_2S is utilized to separate Ce(Io) from Pb^{210}, Bi^{210}, and Po^{210}, complete separation is achieved, with the adsorption, however, of 30% of the Io on the sulfide precipitate.

12264

USE OF THE METHOD OF MICRORADIOGRAPHY UTILIZING LIQUID EMULSIONS IN THE STUDY OF THE CONTENT AND DISTRIBUTION OF RADIOACTIVE ELEMENTS IN ROCKS. V. I. Baranov and G. Tleubergenova. Geokhimiya No. 2, 62-7(1956). (Translated from Referat. Zhur. Khim. No. 9, 1957, Abstract No. 30393.)

The method which has been developed for utilizing liquid emulsions in the study of the content and distribution of radioactive elements in rocks consists in a direct application of the emulsion to the polished section of rock. In this work liquid emulsion of type A_2 was utilized. The surface of the sections was cleaned with ethyl alcohol prior to coating. The emulsion is applied to the section dropwise and is uniformly distributed over the entire surface of the section. For a surface of 5 cm, 5 to 6 drops are sufficient. The section coated with the emulsion was dried, at room temperature, for 1 to 1.5 days. Uniform development in the depths of the emulsion layer is necessary and is effected by means of amidol developer. A study of the transparent sections of the rock, coated with emulsion, was conducted with an MBI-1 microscope at 600x magnification. This method permits the investigation of the distribution of radioactive elements within objects of low activity (10^{-3}% U). The method was used to investigate specimens of quartz porphyry and of other rocks. A chart of the distribution of radioactive inclusions was prepared. In quartz porphyry two generations of radioactive inclusions are clearly manifested; one of them is an early, concurrent formation of porphyry separations; the other is a later formation concomitant with the main body of the rock.

12265

RAPID RADIOMETRIC DETERMINATION OF URANIUM AND THORIUM IN COMPLEX MINERALS. G. Jurain and J. P. Maillot (Centre de Recherches Radiogéologiques, Nancy, France). J. phys. radium 19, Suppl. No. 4, 35A-8A(1958) Apr. (In French)

A rapid radiometric method for the determination of uranium and thorium in complex ores is described. Two gamma-activity-measurements are made with the aid of an assembly of NaI(Tl) scintillation detectors by fixing two different values of gain of the preamplificator. Thus two results are obtained which associated with those obtained by standardization, allow the calculation of the percentage of U and Th. This method is only applicable for ores in radioactive equilibrium. (auth)

12266

GRAVIMETRIC DETERMINATION OF THORIUM AND ITS SEPARATION FROM URANIUM, CERITE EARTHS

AND CERIC SALTS. G. M. Saxena and T. R. Seshadri (Univ. of Delhi). Proc. Indian Acad. Sci. A47, 238-43 (1958) Apr.

Detailed study indicates that flavone and xanthone derivatives are useful as complexing agents for rare metals. Xanthone was found to be a useful reagent for the determination of Th in the presence of U and of cerite earths and ceric salts. 1-Hydroxy-3-methoxy forms a complex in aqueous alcoholic solution at pH 2.4 to 4.0 and can be precipitated with water, dried, and ignited to yield ThO_2. This provides a satisfactory method of estimation of Th in the presence of a large excess of cerite salts, since these are not precipitated by this reagent, and also in the presence of U which is precipitated only at higher pH. (J.E.D.)

12267

THE USE OF THE GAMMA SPECTROMETER FOR THE IDENTIFICATION OF RADIONUCLIDES IN WATER. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 143, Session 35. G. Richard Hagee, A. S. Goldin, and C. P. Straub (Robert A. Taft Sanitary Engineering Center, Cincinnati). New York, American Institute of Chemical Engineers, 1958. 15p.

The availability of commercial gamma spectrometers has greatly simplified the problem of identification of radionuclides. Experience in utilizing this type of equipment for such identification in rain, cistern, and surface waters is described. Data are presented showing differences obtained as a function of water fraction, age of samples, etc. Some information on the applicability of this technique to quantitative determinations of specific radionuclides is also included. (auth)

12268

SOME METHODS FOR THE DETERMINATION OF RADIONUCLIDES IN WATER IN LOW CONCENTRATIONS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 169, Session 35. B. Kahn and S. A. Reynolds (Oak Ridge National Lab., Tenn.). New York, American Institute of Chemical Engineers, 1958. 19p.

Methods are described for concentration of radionuclides from large volumes of water and for subsequent separation and determination of radioactivity. Techniques employed include precipitation, solvent extraction, distillation, and ion exchange. A discussion is given of methods for the radioelements zirconium, niobium, iodine, ruthenium, and strontium. Scintillation spectrometers have been used for identification and quantitative measurement of gamma-active radionuclides. Experimental arrangements are described, and the advantages of the method, such as speed and simplicity, are discussed. Factors limiting sensitivity are listed. Plans for future work in this field are presented. (auth)

Crystallography and Crystal Structure

12269

PREPARATION AND X-RAY STUDY OF SOME TANTALUM HALIDES. Robert F. Rolsten (E. I. du Pont de Nemours and Co., Inc. Wilmington, Del.). J. Am. Chem. Soc. 80, 2952-3(1958) June 20.

Tantalum penta-iodide and -bromide crystallize in the orthorhombic system. The pentaiodide was found to have a pycnometric density of 5.80 g cc^{-1} and an x-ray density of 5.809 g cc^{-1} with eight formula weights per unit cell. The pentabromide was found to have a pycnometric density of 4.99 g cc^{-1} and an x-ray density of 5.238 g cc^{-1} with eight formula weights per unit cell. Tantalum pentachloride crystallizes in the monoclinic system with an x-ray density of 3.761 g cc^{-1}, with twelve formula weights per unit cell. This is an excellent agreement with the pycnometric density of 3.68 g cc^{-1}. A compound corresponding to TaI_4 was prepared and characterized. (auth)

12270

INTERMETALLIC COMPOUNDS BETWEEN LITHIUM AND LEAD. IV. THE CRYSTAL STRUCTURE OF $Li_{22}Pb_5$. A. Zalkin and W. J. Ramsey (Univ. of California, Livermore). J. Phys. Chem. 62, 689-93(1958) June.

The crystal structure of $Li_{22}Pb_5$ has been determined. The face-centered cubic cell contains 80 Pb atoms in space group F23; the cell constant is 20.08 A. The packing of the Li and Pb atoms is analogous to that found for LiPb, Li_8Pb_3, Li_3Pb, and Li_7Pb_2; these structures resemble the body-centered cubic array present in Li metal, with the appropriate number of Li atoms replaced by Pb. (auth)

Deuterium and Deuterium Compounds

12271

SEPARATION OF ORTHOHYDROGEN FROM PARAHYDROGEN AND OF PARADEUTERIUM FROM ORTHODEUTERIUM BY PREFERENTIAL ADSORPTION. Clarence M. Cunningham, Douglas S. Chapin, and Herrick L. Johnston (Ohio State Univ., Columbus). J. Am. Chem. Soc. 80, 2382-4(1958) May 20.

A method for the preparation of orthohydrogen and paradeuterium is described. Hydrogen containing more than 99% orthohydrogen was prepared by a three-stage adsorption–desorption of normal hydrogen (75% ortho) on alumina at 20.4°K and at a pressure of 50 mm of Hg. By a two-stage adsorption–desorption under the same conditions, deuterium containing 76% paradeuterium was prepared from normal deuterium (33.33% para). (auth)

12272

RATES OF SOLVOLYSIS OF SOME DEUTERATED 2-PHENYLETHYL p-TOLUENESULFONATES. William H. Saunders, Jr., Smiljko Ašperger, and David H. Edison (Univ. of Rochester, N. Y.). J. Am. Chem. Soc. 80, 2421-4(1958) May 20.

Rates of solvolysis of 2-phenylethyl (Ia), 2-phenylethyl-1,1-d_2 (Ib) and 2-phenylethyl-2,2-d_2 (Ic) p-toluenesulfonates were determined in formic and in acetic acid. In formolysis Ia and Ic react at the same rate, but Ia reacts 17 ± 2% faster than Ib. In acetolysis small effects are observed with both deuterated compounds: Ia is 3 ± 1% faster than Ib and 4 ± 3% faster than Ic. The formates and acetates produced in the solvolyses were converted to the corresponding 2-phenylethanols II. Comparison of the infrared spectra of the products with those of synthetic mixture of IIb and IIc revealed that ca. 45% phenyl migration had occurred in the formolysis and ca. 10% phenyl migration in acetolysis. These results suggest that phenyl participation predominates in formolysis, but is unimportant in acetolysis. The nature of the transition state in phenyl-participation reactions and the factors contributing to secondary deuterium isotope effects are discussed. (auth)

12273

DEUTERIUM ISOTOPE EFFECTS IN THE BROMINE OXIDATION OF ETHANOL AND OF ACETALDEHYDE. Louis Kaplan (Argonne National Lab., Lemont, Ill.). J. Am. Chem. Soc. 80, 2639-42(1958) June 5.

The rate of oxidation of ethanol-1,1-d_2 by bromine in aqueous solution has been measured over a range of alcohol concentrations from one to 41% by weight, and over a pH range from two to ten. In unbuffered acid solution the ratio of the rates of oxidation of ordinary to that of dideutero alcohol is close to four, proving that a methylene C—H bond is broken in the rate-determining step of the reaction. From the isotope effect and the reaction kinetics it is concluded that ethyl hypobromite plays no role in the oxidation of ethanol, neither as the precursor of acetaldehyde nor as the active oxidant. Under the same conditions acetaldehyde is oxidized at a rate four times that of acetaldehyde-1-d, in accord with the suggestion that the aldehyde is oxidized, via its hydrate, by a mechanism very similar to that for ethanol. At pH 5.5 and 10.3 the isotope effects for the alcohol oxidation are 2.4 and 3.0, respectively. The significance of these lower values cannot be assessed in the absence of detailed knowledge of the reaction products and kinetics under these conditions. (auth)

Fluorine and Fluorine Compounds

Refer also to abstract 12322.

12274

THE SYNTHESIS OF AMMONIUM FLUOROMETALLATES IN METHANOL. Helmut M. Haendler, Frederic A. Johnson, and David S. Crocket (Univ. of New Hampshire, Durham). J. Am. Chem. Soc. 80, 2662-4(1958) June 5.

A series of anhydrous ammonium fluorometallates has been prepared by reaction of methanol solutions of the metal bromides and ammonium fluoride. The products were identified by x-ray and chemical analysis, and include: ammonium tetrafluorobismuthate and nickelate(II); ammonium trifluorocadmate, cobaltate, cuprate, manganate, zincate, and ferrate; ammonium hexafluoromagnesate, and ferrate; ammonium hexafluorogermanate(II), stannate(II), thorate(II), titanate(II), aluminate(III), ferrate(III), indate(III), and ammonium heptafluorozirconate(III). (J.R.D.)

12275

DISSOCIATION ENERGY OF FLUORINE MOLECULES AND THE RULE OF THERMOCHEMICAL LOGARITHMICS. A. F. Kanustinskiy. Trudy Moskov. Khim. Tekhnol. Inst. im. D. I. Mendeleeva 22, 17-20(1956). (Translated from Referat. Zhur. Fiz. No. 3, Abstract No. 6217.)

The author obtains the dissociation energy D of F_2 (the experimental determination of which is difficult) by tracing the variation of D over the elements that comprise its group in the periodic system. The value obtained for D, 71 kcal/mole (at 298°K), is close to the value obtained by Birge (see E. V. Britske et al, Thermoconstants, Published by Academy of Sciences, USSR, 1949).

Graphite

12276 AERE-T/M-162

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

ON THE PROPAGATION OF THERMAL WAVES IN MEDIA WITH STORED ENERGY. A. J. E. Foreman. May 1958. 12p. $0.32(BIS).

Solutions of the heat conduction equation are given for a medium in which stored energy may be released in the form of heat over a certain temperature range, the rate of release of heat being described by several possible types of kinetics. These solutions represent self-sustaining one-dimensional thermal waves propagating with a constant velocity which depends directly on the form assumed for the kinetics of the heat release process. The case where the release of stored energy is controlled by a single activation energy and frequency factor is considered in detail and the results are used to make a preliminary estimate of the velocity of a thermal wave in irradiated graphite. (auth)

12277

CONTACT POTENTIAL MEASUREMENTS ON GRAPHITE. Alan B. Fowler (Harvard Univ., Cambridge, Mass.). J. Appl. Phys. 29, 1132-3(1958) July.

Taft and Apker (Phys. Rev. 99, 1931(1954)) have reported that the work function of finely divided graphite is relatively insensitive to oxygen contamination. In the course of studies of the work function of germanium, reactor-grade graphite was used as a reference in contact potential measurements at pressures of the order of 10^{-9} mm Hg. Because such pressures were far lower than those used by Taft and Apker, a study was made of the influence of oxygen on graphite. Results of the measurements are tabulated. The conclusion was reached that the more rigorously cleaned graphite was less stable than the more contaminated sample, at least until the cleaning pressure of the less clean sample was exceeded. Thus, it appears that the work function of graphite is fairly constant unless it is exposed to oxygen at pressures higher than in any previous exposure. (A.C.)

Laboratories and Equipment

12278 DP-276

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

A DEGASSER FOR IN-LINE INSTRUMENTAL ANALYSES. T. Richard Herold and Edward C. Wingfield. Mar. 1958. 12p. Contract AT(07-2)-1. $0.50(OTS).

A device was developed that provided an air-free liquid stream for instrumental analyses from a solution whose air-to-liquid ratio varied greatly. (auth)

12279 WCAP-216

Westinghouse Electric Corp. Commercial Atomic Power, Pittsburgh.

A CAPILLARY VISCOMETER FOR RAPIDLY SETTLING THORIUM OXIDE SLURRIES. J. S. Rensen. May 28, 1956. 24p. PAR Project. $4.80(ph OTS); $2.70(mf OTS).

A capillary viscometer capable of characterizing unpumped aqueous thorium oxide slurries according to viscosity and yield value was developed, and these parameters determined at 30°C. Thorium oxide prepared from the oxalate and calcined at 650°C with average particle diameter of 3.2 to 6.3 μ was used in the tests. (J.R.D.)

12280

RECENT ADVANCES IN ULTRASONIC DECONTAMINATION. Robert L. Rod (Acoustica Associates, Inc., Mineola, N. Y.). Nucleonics 16, No. 7, 104-5(1958) July.

More efficient transducers make possible larger and

cheaper ultrasonic decontaminators than were previously made. Special decontaminators designed for hemispherical parts, 6 × 3-ft steel plates, reactor fuel rods, and piping are shown. The removal of radioactive salt and radioactive grease and a footware decontaminator are mentioned. (M.H.R.)

12281

DIFFERENTIAL CALORIMETER OF THE TIAN-CALVET TYPE. R. W. Attree, R. L. Cushing, J. A. Ladd, and J. J. Pieroni (Atomic Energy of Canada, Ltd., Chalk River, Ont.). Rev. Sci. Instr. 29, 491-6(1958) June.

A differential microcalorimeter of the Tian-Calvet type has been designed and constructed. The galvanometers previously employed have been replaced by a d-c amplifier, which materially simplified the construction and operation of the instrument. In addition, this allows an electrical analog integrator to be used which gives directly the heat of reaction. Sensitivity of the instrument in the range from 0.01 to 2 cal is such that measurements can be made with a precision of 1% or better. Measurements have been made, under ideal conditions, of 0.002 cal with a standard deviation of 0.1%. (auth)

12282

SIMPLE He II HEAT SWITCH. W. E. Keller, H. S. Sommers, Jr., and J. G. Dash (Los Alamos Scientific Lab., N. Mex.). Rev. Sci. Instr. 29, 530(1958) June.

A simple He II heat switch is described for use in experiments performed below 2.17°K. (W.D.M.)

Molecular Structure

12283

MOLECULAR DIMENSIONS AND INTERACTIONS OF LONG-CHAIN POLYPHOSPHATES IN SODIUM BROMIDE SOLUTIONS. Ulrich P. Strauss and Philip L. Wineman (State Univ., Berkeley, Calif.). J. Am. Chem. Soc. 80, 2366-71(1958) May 20.

Light scattering and viscosity investigations were carried out in aqueous sodium bromide solutions at 25° on samples of sodium polyphosphate whose molecular weights ranged from 11,000 to 1,250,000. Most of the samples were prepared from potassium Kurrol salts by ion exchange; a few were Graham salts. For molecular weights above 70,000, intrinsic viscosity–molecular weight relationships in 0.35 and 0.415M NaBr were $[\eta] = 0.65 \times 10^{-4} M^{0.69}$ and $[\eta] = 4.94 \times 10^{-4} M^{0.50}$, respectively. At lower chain lengths, the exponent of M became smaller in both solvents. From a study of one sample in solutions of several NaBr concentrations, the 0.415M solution was also found to be the one in which the second virial coefficient vanishes. The proportionality of the intrinsic viscosity to the square root of the molecular weight in the same solvent in which the second virial coefficient vanishes is predicted by Flory's theory but apparently has not been demonstrated previously for a polyelectrolyte. The ratio of the molecular dimensions in this theta-solvent to those calculated assuming free rotation about each P–O bond is 1.68 which is close to the corresponding value reported for a silicone but smaller than values obtained with most polymers based on the carbon chain. Theoretical relationships between the second virial coefficient and molecular dimensions are obeyed by sodium polyphosphate to about the same extent as they are by uncharged high polymers. However, the ionic strength dependence of the molecular dimensions could not be fitted to existing theories. The assumptions underlying Flory's equation were examined by an alternate derivation. Other theories could not be applied because of the strong solvent incompatibility of un-ionized $NaPO_3$ groups, which made extrapolation of the molecular dimensions to infinite ionic strength meaningless. (auth)

12284

ELECTRON IMPACT DISSOCIATION OF CAMPHENE-8-C^{13}. L. Friedman and Alfred P. Wolf (Brookhaven National Lab., Upton, N. Y.). J. Am. Chem. Soc. 80, 2424-6(1958) May 20.

Specific fragmentation mechanisms for the formation of $C_9H_{13}^+$ and $C_8H_{11}^+$ ions are established from a study of the mass spectrum of camphene-8-C^{13}. A cyclic structure for $C_7H_9^+$, the most abundant ion in the camphene spectrum, is proposed. (auth)

12285

THE STRUCTURE OF ETHYLENE FROM INFRARED SPECTRA. Harry C. Allen, Jr. and Earle K. Plyler (National Bureau of Standards, Washington). J. Am. Chem. Soc. 80, 2673-6(1958) June 5.

From an analysis of the parallel band of C_2H_4 at 2988.66 cm^{-1} and the parallel band of C_2D_4 at 2201.013 cm^{-1} the inertial constants B and C for each molecule in the ground vibrational state were determined as B = 0.9998, C = 0.8294, and B = 0.7334, C = 0.5636, respectively. From these inertial constants the molecular parameters are deduced to be r_{CC} = 1.337 A, r_{CH} = 1.086 A and $< _{HCH}$ = 177°22′. (auth)

Radiation Chemistry

12286 ANL-5863

Argonne National Lab., Lemont, Ill.

SULFOCHLORINATION OF HYDROCARBONS INDUCED BY GAMMA RADIATION. Alfred Schneider. June 1958. 138p. Contract W-31-109-eng-38. $2.75(OTS).

The purpose of this study was to determine the effect of gamma radiation on the direct sulfochlorination of hydrocarbons and nitrobenzene. The radiation source consisted of spent uranium fuel elements, providing a gamma radiation intensity up to 2.5×10^6 roentgen/hour. The sulfochlorination studies were carried out either with SO_2Cl_2 or with gaseous mixtures of SO_2 and Cl_2. Attempts to sulfochlorinate nitrobenzene and benzene were unsuccessful. There was no detectable reaction in the case of nitrobenzene, while the reaction with benzene produced only chlorinated products, up to the full addition product 1,2,3,4,5,6-hexachlorocyclohexane. Liquid cyclohexane reacted with SO_2 and Cl_2 in the presence of gamma radiation to give very high yields of cyclohexanesulfonyl chloride, and to a smaller extent chlorocyclohexane and cyclohexanedisulfonyl chloride. The length of the chemical chain reaction induced by gamma radiation was estimated at over 2×10^5, and the radiochemical yield G was greater than 10^6. Sulfochlorination was the predominant reaction, but at lower radiation intensities and for SO_2/Cl_2 ratios lower than unity, chlorination was found to exceed sulfochlorination. Within a temperature range of 11.5 to 40.0°C, the selectivity of the reaction was independent of temperature. For a total gas flow rate of 1.9 l/min per liter C_6H_{12} and SO_2/Cl_2 ratios of 2/1, the rate of conversion to $C_6H_{11}SO_2Cl$ was proportional to the square root of the absorbed radiation dose up to a dose rate of 40 rad/min, but became independent of dose rate above 400 rad/min. Under these conditions, the conversion rate was 0.025 g-moles $C_6H_{11}SO_2Cl$/ (l) (min). A basic plant design was developed for the continuous sulfo-

chlorination of cyclohexame initiated by gamma radiation. The economics of this process may become attractive with the expected availability of cheap radiation sources. Solutions of cyclohexane, chlorine, and sulfur dioxide in carbon tetrachloride were irradiated in an oxygen-free system. Reaction rates, equivalent to the rate of disappearance of free chlorine, were determined spectrophotometrically at 4000 A. The reaction products were cyclohexanesulfonyl chloride and hydrochloric acid in nearly stoichiometric quantities. An empirical rate equation was derived, in which the rate of disappearance of chlorine was shown to be proportional to the square root of the product of absorbed radiation, chlorine and cyclohexane concentrations, and independent of the concentration of sulfur dioxide. A chain mechanism was proposed, and the rate equation derived from this scheme was found to be in excellent agreement with the empirical rate equation. The reaction proceeded by a free radical mechanism, as evidenced by the strong inhibiting effect of oxygen. G-numbers were of the order of 10^5, corresponding to an estimated chain length of 5000, which is of the same order as the quantum yield of the photochemical sulfochlorination. Activation energies for the individual reactions were derived from the reaction rate constants at two temperatures and compared favorably with values reported for similar photochemical reactions. (auth)

12287 LTRS-RM-314

Gt. Brit. Low Temperature Research Station. Radiation Group, Cambridge, England.

LOW TEMPERATURE RESEARCH STATION RADIATION GROUP. Summary Report for the Period October 1, 1955—December 31, 1957. R. S. Hannan. 13p.

Studies are reported on the microbiological and chemical changes produced by irradiation of foods and the factors which determine the flavor and odor of the treated product. (auth)

12288

STRUCTURAL AND PHYSICOCHEMICAL MODIFICATION OF POLYETHYLENE UNDER THE ACTION OF AN IONIC FLUX. Claude Sella and Jean-Jacques Trillat. Compt. rend. 246, 3246-8(1958) June 9. (In French)

Irradiation of polyethylene with a low-energy proton beam produced changes in melting point, crystallinity, and crystal parameters. The oxygen-ion beam brought about changes in the surface properties. The fixation of the oxygen is selective on the spheroliths. It permitted the initiation of crosslinking at the surface. (T.R.H.)

12289

FISSION RECOIL DECOMPOSITION OF CALCIUM NITRATE SOLUTIONS. R. G. Sowden and Elizabeth M. Lynde (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Am. Chem. Soc. 80, 2593-4 (1958) May 20.

Calcium nitrate solutions impregnated with $U^{235}O_2(NO_3)_2$ were subjected to a mixed fast neutron-gamma flux in BEPO where more than 95% of the ionizing energy deposited was kinetic energy of fission recoil fragments. (J.R.D.)

12290

PARAMAGNETIC SPECIES PRODUCED BY γ IRRADIATION OF ORGANIC COMPOUNDS. B. Smaller and M. S. Matheson (Argonne National Lab., Lemont, Ill.). J. Chem. Phys. 28, 1169-78(1958) June.

Some alkanes, olefins, alcohols, ethers, and a few other organic compounds have been irradiated with Co^{60} γ rays at low temperatures. The frozen irradiated samples have been examined for paramagnetic resonance, and the observed spectra in several cases have been identified with specific radicals. The methyl, ethyl, and allyl radicals are among those identified. The results in each case have been considered in relation to the present knowledge of the radiation chemistry of the compound. The mode of radical formation in many cases appears to be quite specific. Thus, in normal alkanes the major process for radical formation is by loss of a specific H atom. Hyperconjugation is used to interpret the resonance spectra. (auth)

12291

NEGATIVE ION FORMATION IN N_2O AND IN NO BY ELECTRON IMPACT. Bruce E. Knox and Benjamin P. Burtt (Syracuse Univ., N. Y.). J. Chem. Phys. 28, 1256(1958) June.

A mass spectrometric investigation was made of the negative ions formed in N_2O on electric impact. Electrons with energies from 0 to 50 ev were used. Only the O^- ion was found. Its ion efficiency curve was obtained, and a low-energy resonance capture peak was observed at 2.5 ± 0.2 ev. In addition the negative ion spectrum was obtained for NO using electrons from 0 to 50 ev, and the only ion found was O^-. Apparently NO^- can not be formed by electron collision in NO or N_2O at low pressure. If negative ions other than O^- are present in N_2O or NO, it will probably be at higher pressure where dimerization of NO is possible. (J.E.D.)

12292

HYDROGEN FORMATION IN CONCENTRATED AQUEOUS SODIUM SULFATE SOLUTIONS BY COBALT-60 GAMMA-RAY RADIATION. H. A. Mahlman (OakRidge National Lab., Tenn.). J. Chem. Phys. 28, 1256-7 (1958) June.

The hydrogen yields is degassed concentrated $NaSO_4$ solutions from gamma irradiation with a 900-c Co^{60} source are tabulated for various molarities, pH values, and dose ranges. It is concluded that the total energy absorbed by the solution was effective in decomposing the water and that the bisulfate and sulfate ions are not effective hydrogen atom scavengers. (L.T.W.)

12293

THE X-RAY DECOMPOSITION OF NITROUS OXIDE. Benjamin P. Burtt and John F. Kircher (Syracuse Univ., N. Y.). Radiation Research 9, 1-12(1958) July.

The ion yield for the decomposition of N_2O by x rays has been investigated at 50, 200, and 555 mm of pressure at extremely low intensities by the direct method. The effect of changes in pressure and in applied electric field have been studied. The reactions between the products NO and O_2 were not measurable at room temperature but proceeded immediately when a trap was immersed in liquid nitrogen to solidify the N_2O. By means of these reactions it was possible to determine the relative amounts of the products formed and hence the amount of N_2O decomposed per ion pair. The N_2O ion yield was 4.85 molecules decomposed per ion pair at 555 and 200 mm, but increased to 6.87 as the pressure was lowered to 50 mm. This increase was due to an ion recombination-induced reaction not important at the higher pressures. The yield of O_2 was about 1.3 and was not significantly affected by pressure or by an electric field. The NO yield, however, was greater at 50 mm (4.27) than at the higher pressures (2.24) and was increased by the application of strong electric fields. The mechanisms were discussed. (auth)

12294

REDUCED YIELD IN DILUTE SOLUTIONS IRRADIATED AT VERY HIGH DOSE RATES. Franklin Hutchinson (Yale Univ., New Haven). Radiation Research 9, 13-23 (1958) July.

The irradiation of dilute methylene blue solutions with a high-intensity electron beam producing 10^4 r/μsec pulse gives less radiation-induced decolorization than the same dose given at lower rates. This decrease, which does not appear to have been previously observed, is to be expected from the mechanism involving H and OH radicals usually used to explain the effects of ionizing radiations on dilute solutions. On the basis of this mechanism a simple theory of the rate dependence is derived. From a comparison of theory and experiment it is concluded that the OH radical is extremely likely to react when it collides with a methylene blue molecule, the observed reaction rate being somewhere between 25 and 100% of the maximum possible if a reaction took place on every encounter. (auth)

12295

THE CHLORINATION OF MESITYLENE AND NAPHTHALENE IN THE PRESENCE OF GAMMA RADIATION. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 162, Session 4. W. M. Sergy, J. F. Hanus, J. Oishi, J. J. Martin, and L. C. Anderson (Univ. of Michigan, Ann Arbor). New York, American Institute of Chemical Engineers, 1958. 39p.

The effect of gamma radiation on the rates of chlorination of mesitylene and naphthalene has been studied at a constant dose rate and at different temperatures. Rate data are presented for both the irradiated and non irradiated reactions and the results of product analyses are described. The very rapid reaction of chlorine with mesitylene was found to be essentially unaffected by radiation under the conditions used and therefore, G values of zero were obtained both for the substitution and addition reactions. It was noted that the irradiated runs appeared to yield slightly different chlorinated products from the non irradiated runs. The rate of chlorination of naphthalene was found to be greatly influenced by gamma radiation. Based on chlorine, maximum average G values of 566,000 for substitution and 680,000 for addition were obtained. Several factors which affect the calculation of G values were presented and a new notation was used for the chlorination data. The current G values were calculated for consecutive time intervals throughout the reaction from the kinetic data. (auth)

Radiation Effects

12296

INHIBITION ON CRYSTALLIZATION IN POLYETHYLENE SUBSEQUENT TO GAMMA IRRADIATION. T. F. Williams, H. Matsuo, and M. Dole (Northwestern Univ., Evanston, Ill.). J. Am. Chem. Soc. 80, 2595-6(1958) May 20.

The hypothesis was confirmed that irradiation of polyethylene at room temperature and doses below 29×10^{18} e.v.g.$^{-1}$ causes no change in crystallinity but that on fusion and solidification subsequent to the irradiation, the crystallinity is decreased. The post-irradiation fusion also causes additional vinyl decay and vinylene growth, and it is thought that long branches and gel structure are important in inhibiting crystallization. (J.R.D.)

12297

EFFECTS OF IONIZING RADIATION ON CHOLINE CHLORIDE AND ITS ANALOGS. II. Richard M. Lemmon, Peggy Kwong Gordon, Margaret A. Parsons, and Franco Mazzetti (Univ. of California, Berkeley). J. Am. Chem. Soc. 80, 2730-3(1958) June 5.

The radiation sensitivities of crystalline choline chloride and nineteen crystalline analogs have been compared. The chloride is extremely radiation sensitive and appears to decompose by a free-radical chain mechanism. Choline bromide is about one-third as sensitive as the chloride; none of the other analogs show abnormal radiation instability. That choline chloride's susceptibility to radiation damage is a function of its crystal structure is shown by its contrasting stability in solution. Determinations were made of the radiation sensitivity of crystalline choline chloride at low temperature, in the presence of added iodide or iodine and after repeated recrystallizations. The electron spin resonance signal from irradiated choline chloride also was observed. (auth)

12298

EFFECT OF X-RAYS AND β-IRRADIATION ON α,β,γ,δ-TETRAPHENYLPORPHINE. I. SIRUPY PHOSPHORIC ACID, CONCENTRATED SULFURIC ACID AND 49% SULFURIC ACID AS SOLVENTS. A. Szutka, J. F. Hazel, and Wallace M. McNabb (Univ. of Pennsylvania, Philadelphia). J. Am. Chem. Soc. 80, 3016-19(1958) June 20.

The action of 118 kv x-rays and β-particles on α,β,γ,δ-tetraphenylporphine (TPP) has been studied. The changes occurring on irradiation of TPP in sirupy phosphoric acid, concentrated sulfuric acid and 49% sulfuric acid were followed spectrophotometrically and were found to correspond to one and two electron oxidation states of TPP. The spectra were proven to be qualitatively identical to those produced by the Fenton reaction and ceric ions. The spectrophotometric titrations with ceric ions showed one and two electron oxidations to be involved. The oxidation, whether produced by irradiation or by chemical oxidizing agents, was quantitatively reversed by the addition of ferrous sulfate immediately after oxidation. A more gradual regeneration of the original TPP from both oxidation states in the absence of added reducing agents suggested the disproportionation of oxidized TPP into free TPP and some higher oxidation states from which the original TPP could not be regenerated. A linear relationship was found between irradiation dose and the decrease in optical density of the Soret band up to about 1000 r. A 50% decrease in the Soret band resulted after x-irradiation with approximately 620 r in sirupy phosphoric acid. (auth)

12299

MELTING FRACTURE AND CRYSTALLIZATION OF GAMMA IRRADIATED POLYTETRAFLUOROETHYLENE RESIN. Atsuo Nishioka, Moritaka Tajima, and Masakazu Owaki (Nippon Telegraph and Telephone Public Corp., Tokyo). J. Polymer Sci. 28, 617-19 (1958) Apr.

The zero strength time melting fracture test was applied to Teflon No. 5 and results are given as a function of gamma radiation from 10^2 to 10^7 γ. Chain fracture and reduction in molecular weight due to gamma irradiation were confirmed by decrease of melt viscosity and melting fracture, and increase of crystallinity. It is concluded that the crosslinking effect is negligable in this polymer. (T.R.H.)

12300

VISCOSITY AND ELASTICITY OF GAMMA-IRRADIATED POLYTETRAFLUOROETHYLENE RESIN ABOVE THE MELTING POINT. Kazuyoshi Matsumae, Muneo Watanabe, Atsuo Nishioka, and Torao Ichimiya (Nippon Telegraph and Telephone Public Corp., Tokyo). J. Polymer Sci. 28, 653-5(1958) Apr.

Viscosity vs. radiation dose from 10^2 to 10^7 γ and instantaneous elastic modulus vs. temperature were determined for Teflon No. 5. A decrease of the rubbery elasticity is implied by the data. This is attributed to shortening of the chain length tending to decrease entanglement of chain segments. (T.R.H.)

12301

MOLECULAR INTERACTIONS IN IRRADIATED SOLIDS. Amos Norman and William Ginoza (Univ. of California, Los Angeles). Radiation Research 9, 77-83(1958) July.

Evidence for molecular interactions in irradiated solids was found both in the electron paramagnetic resonance spectra of various x-irradiated molecular mixture and in the increased radiation resistance of catalase induced by glutathione. The spectroscopic data imply that electron transfer can occur between molecules in irradiated solids. Such electron transfer from glutathione to catalase could account for the observed data on the inactivation of catalase. (auth)

Rare Earths and Rare-earth Compounds

12302

EUROPIUM HEXABORIDE AND LANTHANUM TETRABORIDE. Edward J. Felten, Ira Binder, and Ben Post (Brooklyn Polytechnic Inst., N. Y.). J. Am. Chem. Soc. 80, 3479(1958) July 5.

To check a size anomaly observed in rare earths, EuB_6 was prepared and the lattice constant measured. EuB_4 could not be prepared, a fact probably related to the large effective size of the metal atom. To check this LaB_4 was prepared. (T.R.H.)

12303

THE 8-QUINOLINOL-5-SULFONIC ACID CHELATES OF SOME RARE EARTH METAL IONS. Ben F. Freasier, A. G. Oberg, and Wesley W. Wendlandt (Texas Tech. Coll., Lubbock). J. Phys. Chem. 62, 700-2(1958) June.

The formation constants for the 8-quinolinol-5-sulfonic acid chelates of lanthanum, cerium(III), praseodymium, neodymium, samarium, gadolinium, and erbium were determined at three different ionic strengths and at three different temperatures. The three thermodynamic functions, ΔF^0, ΔH^0, and ΔS^0, were calculated for the metal chelates at 25° and $\mu = 0$. The bonding in the complexes was shown to be ionic in nature. (auth)

12304

THE GROWTH OF SINGLE CRYSTALS OF MAGNETIC GARNETS. J. W. Nielsen and E. G. Dearborn (Bell Telephone Labs., Inc., Murray Hill, N. J.). Phys. and Chem. Solids 5, 202-7(1958) May.

Crystals of magnetic garnets, $Y_3Fe_5O_{12}$, $Sm_3Fe_5O_{12}$, $Er_3Fe_5O_{12}$, and $Gd_3Fe_5O_{12}$, suitable for many research purposes have been grown from iron-rich melts of lead oxide. A satisfactory composition is PbO 52.5, Fe_2O_3 44, and M_2O_3 3.5 mole per cent, where M is Y, Sm, Er, or Gd. Portions of the phase equilibrium diagrams for the systems Fe_2O_3—$YFeO_3$ and PbO—Y_2O_3—Fe_2O_3 have been approximately determined. All the data obtained concerning the growth of magnetic garnets are consistent with these diagrams. (auth)

12305

MAGNETIZATION IN SINGLE CRYSTALS OF SOME RARE-EARTH ORTHOFERRITES. R. M. Bozorth, Vivian Kramer, and J. P. Remeika (Bell Telephone Labs., Murray Hill, N. J.). Phys. Rev. Letters 1, 3-4 (1958) July 1.

Single crystals of the rare-earth orthoferrites ($MFeO_3$) have been prepared and their magnetic properties measured from room temperature to 1.3°K for M = Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu. (L.T.W.)

12306

"ANORMAL" VALENCES OF RARE EARTH ELEMENTS IN PROCESSES OF THEIR SEPARATION. REPORT 1. ELECTROLYTIC REDUCTION OF YTTERBIUM. D. I. Ryabchikov, Yu. S. Sklyarenko, and N. S. Stroganova. Zhur. Neorg. Khim. 1, No. 9, 1954-67(1956). (Translated from Referat. Zhur. Khim. No. 8, 1957, Abstract No. 26431.)

The influence of various factors on the yield of Yb in the electrolytic reduction of a solution containing ytterbium acetate $Yb(Ac)_3$ and potassium citrate K_3Cit was studied using a Hg and a Pt anode. The dry citrate was added to the acetate solution, and the pH was adjusted by adding CH_3COOH or KOH. The electrolysis was carried out for one hour at 12 v and a cathode current density of 0.05 amp/cm^2, after which the amalgam was detached and dissolved with HCl. The maximum yield of Yb was at pH 6.0. The yield decreases gradually with a pH change to 4.0 and drops sharply at pH 3.0. The optimum cathode current density was 0.025 amp/cm^2. A temperature rise from −5 to 5° results in a small increase of the yield, but a further temperature rise to 50° decreases the yield by a factor of two. The mechanism for the formation of the amalgam is probably the dissociation of $Yb(Ac)_3$, formation of the complex $K_3[Yb(Cit)_2]$ and its dissociation, reduction of Yb^{3+} to Yb^{2+}, and reduction of Yb^{2+} to the amalgam. The conditions for the optimum yield of 98.2% Yb are pH 6, temperature 5°, a solution concentration of 2.0% Yb_2O_3, and a molar ratio of $Yb_2O_3 : K_3Cit :: 1 : 2$. (J.S.R.)

Separation Procedures

12307 AECD-4267

Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.

ZIRCEX FLUORIDE VOLATILITY COMBINATION. P. R. Ammann, D. A. Madden, and D. L. Swift. Mar. 20, 1958. Decl. with deletions June 19, 1958. 29p. For Union Carbide Nuclear Co. [K-25 Plant]. Contract W-7405-eng-26, Subcontract 70. (KT-339(Del.)). $4.80 (ph OTS); $2.70(mf OTS).

In using the Zircex Process head-end to recover Zr from fuel elements before recovery of U by fluoride volatility, loss of U as UCl_4 is a problem. The suitability of using a Ni wire filter for trapping entrained UCl_4, and recovery of the trapped U by direct fluorination of filter and residue is investigated. It is recommended from these studies that water vapor and oxygen should be kept out of the reactor, and that the filter and filter material should be further investigated. (T.R.H.)

12308 AECU-3772

Massachusetts Inst. of Tech., Cambridge. Lab. for Nuclear Science.

PROGRESS REPORT NO. 52 [FOR] DECEMBER 1, 1957 THROUGH FEBRUARY 28, 1958. Feb. 28, 1958. 87p. Contracts AT(30-1)-905 and Nonr-1841(16). $13.80 (ph OTS); $4.80(mf OTS).

Some approximate values of the concentrations of the chlorine ion and the mean activity coefficients of HCl in Dowex 50, as functions of the mean activity of HCl are given. The KCl uptake by anion-exchange resins, Dowex 1 and 2, is plotted. Ion-exchange phase properties of HCl were determined from freezing point measurements. The thermodynamic acid dissociation constants of $HClO_4$, HCl, HNO_3, HBr, and $HGaCl_4$ in water-saturated bis(2-chloroethyl) ether, were obtained from conductometric measurements. The distribution behavior of $InBr_3$ and $InCl_3$ in HBr and HCl was studied. Information is given on the extraction of Zn and Ag from chloride solutions by dioctylamine salts. Ion exchange equilibria between hexammino-cobalt(III) and chloro-pentammino-cobalt(II) ions in respect to La ions in Dowex 50 NaR are plotted. Typical radiochemical activation analyses for K in geologic materials are tabulated. The postulated nuclear level scheme and the calculated and experimental positron decay following (γ,n) activation of Br^{79} are shown for Br^{78}. Cumulative fission yields in the deuteron fission of U^{235} are tabulated. Cosmic ray data obtained with a new high-counting rate meson monitor are plotted. The equipment used and data obtained in a search for long-lived particles with mass ~550m_e in the cosmic-ray flux at sea level are shown. The excited states of Ni^{59} and Ni^{61} obtained from (d,p) reactions of Ni^{58} and Ni^{60} are tabulated. (For preceding period see AECU-3685.) (M.H.R.)

12309 HW-56096

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

EVALUATION OF ION EXCHANGE MEMBRANES FOR USE IN THE FLUREX PROCESS. Erwin W. Neuvar and Wallace W. Schulz. May 26, 1958. 48p. Contract W-31-09-eng-52. $7.80(ph OTS); $3.30(mf OTS).

In the Flurex process, uranium (IV) fluoride salts are prepared from an aqueous uranyl nitrate feed. A three-compartment electrolytic cell consisting of anode, feed, and cathode compartments separately by anion and cation exchange membranes, respectively, is used. Nitrate ion from the uranyl nitrate feed migrates to the anolyte; uranyl ion migrates to the catholyte where it is reduced at a mercury cathode. Several commercially available ion exchange membranes (Permutit, Nalfilm, Nepton), both anion and cation, were evaluated for use in the cell. Relative permselectivity, conductivity, and hydraulic permeability of the membranes and changes in these properties during long-term exposure of the membranes in process solutions [$UO_2(NO_3)_2$, UO_2F_2, NH_4F, HF] at temperatures up to 90°C are presented. Under certain conditions cation membranes behave much like polarized electrodes and show a limiting current density in the solutions studied. The effect of solution composition on limiting current density for several cation exchange membranes is shown. Relationships between the various membrane properties and over-all efficiency of the process are discussed. Permutit 3142 cation and Permutit 3148 and Nepton AR-111 anion membranes were found to be most suitable for use in the Flurex process. (auth)

12310 ORNL-2443

Oak Ridge National Lab., Tenn.

PROGRESS REPORT ON RAW MATERIALS FOR SEPTEMBER 1957. Chemical Technology Div. K. B. Brown, C. F. Coleman, D. J. Crouse, and A. D. Ryon. Jan. 29, 1958. 39p. Contract W-7405-eng-26. $1.25(OTS).

Systematic Studies. In di(2-ethylhexyl)phosphoric acid extractions of several metal ions in the presence of radiotracer-labeled inorganic phosphate, the phosphate accompanied extracted Fe(III) and Al, but not V(IV) or Mo(VI) in amounts that could cause significant contamination of a vanadium product. In the extraction of thorium from sulfate solution with di(2-ethylhexyl) phosphoric acid, extraction coefficients were lowered but still usable in the presence of enough decanol to prevent third-phase formation in alkaline stripping. Tri-n-octylphosphine oxide in kerosene extracted thorium effectively from 1 and 4 M HNO_3 and from 4 but not 1 M HCl. The coefficients increased rapidly with increasing phosphine oxide concentration. In measurement of acid extraction by amine diluent combinations, the aqueous pH at which enough acid was extracted to neutralize half the amine varied with amine class, primary > secondary > tertiary; with branching, straight chain > branched chain; with diluent, chloroform > benzene > kerosene; and with anion, $HClO_4$ > H_2SO_4. Melting points, apparent molecular weights, and assay test results are reported for tri-n-octylphosphine oxide batches from several different sources. Process Development Studies. In continued studies of the Amex vanadium process, the effects of several extraction variables were examined and the vanadium extraction abilities of three different amines were compared. Rate tests showed rapid extraction of most of the vanadium although the final approach to equilibrium was quite slow. Vanadium coefficients, which were low at pH 1.4, increased rapidly with increasing pH particularly in the region of pH 2. The coefficients also increased as the sulfate concentration decreased. Isotherms for extraction of vanadium with 0.1 M solutions of S-24, 9D-178, and tri-iso-octylamines were of unconventional shape, showing (at least over a portion of the curves) an increase rather than a decrease in vanadium extraction efficiency with increase in vanadium loadings. Maximum vanadium loadings (0.1 M amine) were in the range 11.5-13 g/liter. Thorium was efficiently recovered from Amex carbonate strip solutions by adjusting the pH to pH > 13 with caustic or to 5-6 with sulfuric acid. Precipitates from the sulfuric acid method filtered much more readily than those produced with caustic. Under certain precipitation conditions thorium was effectively separated from the small amount of uranium in the strip solution. In the Dapex system, contact of air with the mixed organic and aqueous phases results in some oxidation of iron(II). The amount of iron oxidized, although relatively small, is of sufficient magnitude to suggest that, for best results in a vanadium recovery process, the extraction mixers should be designed to minimize contact with air. Engineering Studies. The kinetics of vanadium(IV) and iron(III) extraction by Dapex in batch mixer tests were well represented by first-order rate constants similar to those previously reported for uranium extraction. The rate of extraction for each metal increased with approximately the cube root of power input to the mixer. The relative rates of extraction, expressed as rate constants, were 1.62 for uranium, 0.95 for vanadium, and 0.11 for iron at a power input of 30 hp per 1000 gal of mixer volume. Fundamental Studies. Comparison of the infrared spectra of n-octane solutions of di(2-ethylhexyl)phosphoric acid (D2EHPA), tributylphosphate (TBP), and tri-n-octylphosphine oxide (TOPO) showed some D2EHPA-TBP association, and considerable D2EHPA-TOPO association. Measurements of the latter by the method of continuous variations indicated the formation of an association product at a mole ratio of 1/1. Molecular weight determinations by light scattering indicated that in benzene solution tri-n-octylamine

bisulfate is dimerized, while 1-(3-ethylpentyl)-4-ethyloctylamine and N-benzyl-1-(3-ethylpentyl)-4-ethyloctylamine form aggregates averaging ~ 11 and 15-20 sulfate units, respectively. Rare-Earth Separations. Distribution of rare earths between their saturated aqueous nitrate solutions and tributylphosphate gives separation factors which increase with acidity up to 16 M HNO_3. Maximum factors between adjoining elements exceed 1.5 in the lighter half of the lanthanide series but decrease to about 1.2 at the end of the series. Operation of multistage separators has produced individual rare earths and confirmed and extended single-stage data. (auth)

12311 WIN-35

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

RESIN-IN-PULP PILOT PLANT TESTING OF WHITE CANYON ORES. J. Q. Jones, W. A. Millsap, T. F. Izzo, and R. L. Shimmin. Feb. 13, 1956. Changed from OFFICIAL USE ONLY Sept. 5, 1957. 45p. Contract AT(49-6)-924. $7.80(ph OTS); $3.50(mf OTS).

During the period of September 15 to November 14, 1955, White Canyon ore from Stockpiles 19 and 35 at Monticello, Utah, was treated in the Acid Leach Resin-In-Pulp Pilot Plant at Grand Junction, Colorado. The ore contained in these stockpiles originally came from the White Canyon area of Utah. The report contains detailed information on grinding, leaching, sand-slime separation, ion exchange, and precipitation in connection with the processing of this ore. Results show the ore to be amenable to the Resin-In-Pulp process. (auth)

12312 WIN-36

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

LABORATORY TESTING OF LITTLE MAN CLAIM ORE. George Trueman. Feb. 23, 1956. Changed from OFFICIAL USE ONLY Sept. 5, 1957. 17p. Contract AT(49-6)-924. $3.30(ph OTS); $2.40(mf OTS).

Laboratory studies were made of a sample of ore from the Little Man Claim in Wyoming. The amenability of the ore to acid leaching and ion exchange was investigated as well as the possibility of molybdenum removal by flotation. (auth)

12313 WIN-38

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

AMENABILITY TESTING OF HOMESTAKE LITTLE BEAVER AND RICHARDSON CLAIM ORES. G[eorge] Trueman, E. S. Porter, H. I. Viklund, and J. B. Larson. Sept. 10, 1956. Changed from OFFICIAL USE ONLY Sept. 5, 1957. 30p. Contract AT(49-6)-924. $6.30 (ph OTS); $3.00(mf OTS).

The results of the laboratory investigation of ore samples from the Little Beaver claim and from the Richardson claim are discussed. Data are presented on carbonate leaching, acid leaching, settling and filtration, and ion exchange of acid liquors. (auth)

12314 WIN-44

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

ACID LEACH CCD—COLUMNS PILOT PLANT TESTING OF LUCKY Mc ORE. T. F. Izzo, J. Q. Jones, and R. L. Shimmin. May 12, 1956. Changed from OFFICIAL USE ONLY Sept. 5, 1957. 64p. Contract AT(49-6)-924. $10.80(ph OTS); $3.90(mf OTS).

From January 24 to April 10, 1956, Lucky Mc ore from the Riverton area of Wyoming was treated in the Acid Leach CCD—Columns Pilot Plant at Grand Junction, Colorado. The report contains detailed information on the grinding, leaching, liquid-solid separation by continuous countercurrent decantation, ion exchange, and precipitation in connection with the processing of this ore. A section is included on mill design considerations. Results show the ore to be amenable to the CCD-Columns recovery process. (auth)

12315 WIN-64

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

AMENABILITY TESTING OF ADDITIONAL SAMPLES FROM THE AMBROSIA LAKE DISTRICT. R. U. Johnson, H. I. Viklund, and E. J. Hammond. May 12, 1958. 25p. Contract AT(49-6)-924. $4.80(ph OTS); $2.70(mf OTS).

The results of laboratory amenability testing of five samples from the Ambrosia Lake District in New Mexico, including acid and carbonate leaching, settling and filtration testing, and solvent extraction of leach liquors, are presented. The samples were received too late to be included in Topical Report WIN-56. (J.R.D.)

12316

STUDIES ON THE SEPARATION OF ALKALINE EARTH ELEMENTS. V. COPRECIPITATION OF RADIUM IN THE INDUCED PRECIPITATE OF LEAD SULFATE. Mutsuaki Shinagawa and Toshifumi Murata (Hiroshima Univ.). Bull. Chem. Soc. Japan 31, 166-8(1958) Mar.

Experiments are described which show that the induced precipitation of $PbSO_4$ by Ba can be used as an efficient method of separating or concentrating Ra. (T.R.H.)

12317

SEPARATION OF RHENIUM FROM VANADIUM AND TUNGSTEN BY ION-EXCHANGE CHROMATOGRAPHY. D. I. Ryabchikov and A. I. Lazaryev (Academy of Sciences, USSR). Trudy Komis. Anal. Khim. Akad. Nauk S.S.S.R. 7, No. 10, 64-7(1956). (Translated from Referat. Zhur. Khim. No. 1, 1957, Abstract No. 1236.)

Rhenium may be separated from V by passing a 0.3N HCl solution containing both ions through a column packed with MMG-1 anion exchange resin (OH form). Washing with 0.3N HCl solution elutes the V, and then the Re retained on the resin is eluted with 2.5N NaOH. The separation may also be effected with SBS cation-exchange resin (hydrogen form). In this case the Re is eluted with acidified water, and then the V is eluted by washing with a 1:4 NH_3 solution. For the separation of V from W the solution with a pH 1 is passed through a column packed with anion-exchange Al_2O_3. The V is eluted by successive washing with a pH 1 solution containing H_2O_2 and then the same solution with no peroxide. The W is then eluted with an ammonia solution. The V and W are determined in the filtrates by the usual methods. For the separation of Re from W the solution, acid to congo paper, is passed through a column of Al_2O_3. The Re is eluted with HCl, and the W is then eluted with an ammonia solution. The Re and W may be determined in the filtrates. The method for the preparation of the Al_2O_3 anion-exchange column is described. (J.S.R.)

12318

KINETIC EFFECTS IN THE PARTITIONING OF URANIUM AND PLUTONIUM IN THE PROCESSING OF IRRADIATED REACTOR FUELS BY EXTRACTION WITH TRIBUTYL PHOSPHATE. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 168, Session 37. W. W.

Morgan, W. G. Mathers, and R. G. Hart (Atomic Energy of Canada, Ltd., Chalk River, Ont.). New York, American Institute of Chemical Engineers, 1958. 26p.

A study of the chemical variables in the operation of contactor II of the TBP (tributyl phosphate) process for irradiated uranium has been carried out. Conditions under which small amounts of plutonium are precipitated in this contactor have been observed, and various methods of avoiding this precipitation have been discovered. A study of the effect of trace quantities of dibutyl phosphate on the operation of this contactor have clearly shown it to have a detrimental effect on the decontamination of uranium from plutonium. By allowing time for the uranium in the solvent to compete with the plutonium for the dibutyl phosphate it has been found possible to eliminate this interference. By this technique a uranium product stream was obtained with a uranium to plutonium weight ratio of 3.9×10^8. Under the best operating conditions found in this work, 0.1 M hydroxyl ammonium nitrate proved to be as effective a stripping agent as ferrous ion. (auth)

Sorption Phenomena

12319 AECU-3759

Utah. Univ., Salt Lake City. Inst. for the Study of Rate Processes.

A KINETIC STUDY OF CO_2 DESORPTION FROM THORIA. Technical Report No. II. Charles H. Pitt and Milton E. Wadsworth. Apr. 15, 1958. 19p. For Oak Ridge National Lab. Contract W-7405-eng-26. Subcontract 1075. $3.30(ph OTS); $2.40(mf OTS).

Desorption rate curves were obtained for carbon dioxide adsorbed on thoria at temperatures of 550, 450, 350, 250, 150, and 50°C. The gas was found to desorb according to a logarithmic law following initial rapid desorption. The logarithmic law may be shown to be operative if the activation energy for desorption varies linearly with surface coverage. A large apparent negative entropy of activation for desorption supports the fact that the adsorbed CO_2 is in a mobile state. (auth)

12320

THE DETERMINATION OF THE FORMULAS OF AQUEOUS RUTHENIUM(III) SPECIES BY MEANS OF ION-EXCHANGE RESIN: Ru^{+3}, $RuCl^{+2}$ AND $RuCl_2^+$. Howard H. Cady and Robert E. Connick (Univ. of California, Berkeley). J. Am. Chem. Soc. 80, 2646-52 (1958) June 5.

The formulas of some aqueous ruthenium(III) species have been determined by a method which utilizes the properties of ion-exchange resins. The method is applicable when equilibria between the species of interest and other species of significant concentration are established slowly, and when the species of interest can be isolated in solution, as for example certain complex ions. In one experiment the charge per metal atom is found from the equivalents of charge exchanged with an ion-exchange resin per gram atom of the metal. In a second experiment the total charge per species is determined from the concentration dependence of the ion-exchange equilibrium of the unknown species with an ion of known charge. The total charge divided by the charge per atom gives the degree of polymerization of the species. The stoichiometric formula can be inferred when a single anion is involved in complexing. The method has been employed to establish the formulas of the species Ru^{+3} and $RuCl^{+2}$. A species shown to have a total charge of +1 is probably $RuCl_2^+$. The separation of the ruthenium species was accomplished by "pushing" with cerous ion a dilute mixture of species on an ion-exchange column, with the result that nearly pure bands of the individual species were obtained at high concentration. (auth)

Spectroscopy

12321 ORNL-2529

Oak Ridge National Lab., Tenn.

COMPARISON OF THEORETICAL AND EXPERIMENTAL FILTERED X-RAY SPECTRA (thesis). J. C. Villforth, R. D. Birkhoff, and H. H. Hubbell, Jr. July 15, 1958. 87p. Contract W-7405-eng-26. $2.25 (OTS).

Submitted to Vanderbilt Univ.

Spectral distributions of filtered x-ray beams have been taken for six x-ray tube voltages from 30 to 250 kev with a sodium iodide scintillation spectrometer. The spectrometer was calibrated for energy response and resolution with gamma rays and K x rays from radioactive isotopes as well as K x rays from fluorescent radiators. Since the spectrometer failed to resolve the K series lines, a better estimate of the resolution constant was obtained by filtering out the K_β lines with an absorber of slightly lower Z than the radiator. For example, in the case of the K lines of uranium filtering with thorium reduced the width of the K lines profile from 36% greater to only 6% greater than the value expected for the profile of a monoenergetic line. Calculated correction curves permitted a determination of the resolution constant from the observed profiles of either the filtered or unfiltered K series. Some of the filters and radiators were made by casting appropriate chemical compounds in plastic. The effect of the scintillation spectrometer resolution was removed from each experimental spectrum by an iteration method. Two iterations were necessary in order to obtain a system which when combined with the spectrometer line profile would yield the experimental distribution within an error of about 4%. Corrections were also made to the iterated spectra where necessary to reduce the effect of the loss of photons from iodine K escape and lack of complete absorption in the crystal. The corrected experimental spectra were compared to spectra calculated from Kramers' distribution and the absorption in the filters. Agreement was good except for the 30 kev spectra, which was displaced slightly, due probably to the difficulties found in calibrating the spectrometer at low energy. The average energies and most probable energies agreed within 3%. In addition to these values, the effective energies were obtained by the absorption method using a standard air chamber. These values were within 3.5% of the corrected experimental average energy except for the two low energy spectra which differed by as much as 10%. (auth)

12322

HYDROGEN FLUORIDE POLYMER SPECTRUM, HEXAMER AND TETRAMER. D. F. Smith (Union Carbide Nuclear Co., Oak Ridge, Tenn.). J. Chem. Phys. 28, 1040-56(1958) June.

The experimental techniques employed to investigate the polymer absorption are presented. Experimental results at various pressures at temperatures from −70 to +73°C are presented. The more important qualitative features noted are: (1) the absorption is strongly dependent upon both the temperature and pressure;

(2) in some cases the shape of the bands is dependent upon the pressure; (3) at low temperature only very low pressures of vapor (hence of polymer) are necessary to observe some absorption. The application of Dalton's law, the law of mass action, Lambert's law, and Beer's law, as well as Van't Hoff's equation to the hydrogen fluoride monomer-polymer system is discussed. It is then shown that under some special circumstances the absorption varies simply as the fourth power of the pressure, under others as the sixth power of the pressure, but more generally where the absorption is strong as the sum of two terms, one containing the fourth power of the pressure the other the sixth power. The absorption thus corresponds to the overlapping spectra of a tetramer and of a hexamer, which can be separated on the basis of this pressure dependence. From the temperature variation of the absorption, the heats of polymerization are estimated as $\Delta H_4 = -19$ kcal/mole and $\Delta H_6 = -40$ kcal/mole. In general, the absorption outside the range of monomer absorption is as consistent with a tetramer-hexamer interpretation for deuterium fluoride as for hydrogen fluoride. (auth)

12323

POLARIZED INFRARED SPECTRUM OF POTASSIUM THIOCYANATE. Llewellyn H. Jones (Los Alamos Scientific Lab., N. Mex.). J. Chem. Phys. 28, 1234-6 (1958) June.

The polarized infrared spectrum of crystalline potassium thiocyanate is reported. This additional information necessitates certain assignment changes in the observed vibrational frequencies from those previously reported. The vibrational spectrum now appears quite complete and in agreement with the crystal structure report of Klug. (auth)

Syntheses

12324 NP-6809

California Research Corp., Richmond, Calif.
DEVELOPMENT OF AN ADVANCED NUCLEAR RADIATION-RESISTANT HYDRAULIC FLUID. Quarterly Report No. 1. May 31, 1958. 16p. Project No. 8(1-125A)5133. Contract AF-33(616)-5583.

The synthesis program was active along two paths: the development of base stocks having superior viscosity and low temperature properties and the study of highly aromatic polymers for use as viscosity index improvers. Substantial progress was achieved in both lines of endeavor. Some unsymmetrically-substituted diarylalkanes, typified by sec-propyl-1,9-diphenylnonane, possessed relatively low pour points and fairly high viscosity indexes. Polymers made from α,α'-dichloroxylene and various other aromatic compounds were effective in improving the viscosity index of a base fluid. The evaluation of these polymers is preliminary and much additional testing will be required. (auth)

12325

CYANIDE EFFECTS ON CARBON DIOXIDE FIXATION IN CHLORELLA. B. R. Rabin, D. F. Shaw, N. G. Pon, J. M. Anderson, and M. Calvin (Univ. of California, Berkeley). J. Am. Chem. Soc. 80, 2528-32(1958) May 20.

Green algae have been treated with radioactive KCN in an investigation of the action of cyanide on photosynthesis. A multitude of products have been found to be formed in very short exposures (10–15 sec). One of these products has been identified with the product formed when the algae are given radioactive CO_2 and non-radioactive KCN. The same product has been synthesized by a non-enzymatic cyanohydrin addition reaction on ribulose 1,5-diphosphate. It has been shown to be a 2-carboxy-pentitol (probably mostly ribitol) 1,5-diphosphate. Upon hydrolysis it gives an hydroxy acid (or mixture of isomers) closely related to hamamelonic acid. The significance of this and the other as yet unidentified products of cyanide interaction with a biological system is discussed with respect to the use of cyanide as an inhibitor. (auth)

12326

NEW PREPARATION FOR CHROMYL FLUORIDE AND CHROMYL CHLORIDE. Gerald D. Flesch and Harry J. Svec (Iowa State Coll., Ames). J. Am. Chem. Soc. 80, 3189-91(1958) July 5.

Uncontaminated chromyl fluoride and chromyl chloride have been prepared by the reaction of dry CrO_3 with CoF_3 or $AlCl_3$. The mixed halide, CrO_2FCl, was produced by the metastatic reaction of the two pure compounds. The equilibrium constant for this reaction and the infrared spectra of the mixed halide are presented. (auth)

Tracer Applications

12327

WORK WITH LABELED INITIATORS. J. C. Bevington (The Univ., Birmingham, Eng.). J. Polymer Sci. 29, 235-43(1958) May.

Research work with labeled azoisobutyronitrile, benzoyl peroxide, and substituted benzoyl peroxides as reaction initiators is summarized, and the direction of present progress is indicated. (T.R.H.)

Transuranic Elements and Compounds

12328 NP-tr-105

PLUTONIUM DIOXIDE AS A NUCLEAR FUEL. M. Taube. Translated by J. Adam from Nukleonika 2, 465-78(1957). 10p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 4774.

12329

ATTEMPTS TO CONFIRM THE EXISTENCE OF THE 10-MINUTE ISOTOPE OF 102. A. Ghiorso, T. Sikkeland, J. R. Walton, and G. T. Seaborg (Univ. of California, Berkeley). Phys. Rev. Letters 1, 17-18(1958) July 1.

Fields et al. (Phys. Rev. 107, 1460(1957)) reported an isotope of element 102 with an α activity having an energy of 8.5 ± 0.1 Mev and a half life of ~10 min. Attempts to confirm the results of this experiment are reported. It is concluded that the activity found cannot be ascribed to element 102. (L.T.W.)

12330

ELEMENT NO. 102. A. Ghiorso, T. Sikkeland, J. R. Walton, and G. T. Seaborg (Univ. of California, Berkeley). Phys. Rev. Letters 1, 18-21(1958) July 1.

An unambiguous identification of an isotope of element 102 was made by a radically new method. The chemical identification of an isotope of fermium (Fm^{250}) as the daughter of an α-emitting isotope of element 102 (102^{254}) was carried out. The method used to detect the isotope of element 102 was essentially a continuous milking ex-

periment wherein the atoms of the daughter element 100 were separated from the parent element 102 by taking advantage of the recoil due to the element 102 α decay. (L.T.W.)

Uranium and Uranium Compounds

Refer also to abstract 12382.

12331 AECD-4268
National Lead Co. of Ohio, Cincinnati.
DETERMINING SAMPLING RELIABILITY IN BULK ORES. A. Church, Jr. [1957]. Decl. Oct. 15, 1957. 41p. Contract AT(30-1)-1156. (M-6385). $7.80(ph OTS); $3.30(mf OTS).

For presentation at the First Annual Tech. Conference of the Chem. Div. of the Am. Soc. for Quality Control, Oct. 19, 1957.

The problem of evaluating the method of sampling used on a particular uranium ore or concentrate is considered. It is pointed out that the purpose of this evaluation is to obtain data on possible biases of the sampling method, the way the sample is prepared for analysis, and the analysis itself. In addition, it is pointed out that some estimate of precision, either over-all or individually, for each step is required. Examples of the use of the analysis of variance approach to these problems are given. Finally, some remarks are included on sampling problems associated with other materials used by the Feed Materials Production Center. (auth)

12332 AERE-CE/R-2052
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
CRITICAL ASSEMBLIES OF AQUEOUS URANYL FLUORIDE SOLUTIONS. PART II. PREPARATION AND HANDLING OF SOLUTIONS. J. E. Cunningham, G. P. Wall, and I. Wells. Apr. 1958. 28p. $1.08(BIS).

Light-water solutions of U^{235} and U^{238} in the form of uranyl fluoride have been prepared and dispensed to the Zero Energy Thermal Reactor. The development of the process, equipment, and handling techniques are described along with experimental criticality test techniques, results, and an analysis of the results. (auth)

12333 CD-460
Tennessee Eastman Corp., Oak Ridge, Tenn.
A MIXED TUBALLOY (URANIUM) TETRAHALIDE. J. W. Gates, Jr., L. J. Andrews, B. P. Block, and H. A. Young. Aug. 26, 1944. Decl. Nov. 21, 1955. 2p. $1.80(ph OTS); $1.80(mf OTS).

The compound UF_2Cl_2 with the ratio U/F/Cl of 1:2:1.63 was prepared by fluorination of UO_3 with aqueous HF and vapor-phase chlorination with CCl_4 at 450°C. The various tests to define the compound and components are presented. (J.R.D.)

12334 RME-3143
Colorado School of Mines Research Foundation, Inc., Golden.
STUDIES REGARDING THE ROLE OF WYOMING NATURAL GAS IN PRECIPITATING PRIMARY URANIUM MINERALS FROM PREGNANT SOLUTIONS. Harry M. Sims and Fred L. Smith. May 11, 1956. 58p. Project No. 550837. Contract AT(05-1)-462. $1.75 (OTS).

The chemical feasibility of depositing a primary uranium material from a pregnant solution by exposing the solution to natural gas in an environment favorable to such deposition was tested. It was found that the precipitation is achieved by reduction of soluble hexavalent uranium salts to insoluble tetravalent compounds. The reducing agent is primarily the hydrogen sulfide in the natural gas; however, hydrogen and methane present in the gas and ferrous ions in the solution contribute to the reaction. (J.R.D.)

12335 NLCO-731
National Lead Co. of Ohio, Cincinnati.
LABORATORY AND PILOT PLANT EVALUATION OF ALGOM URANIUM CONCENTRATE. Clark T. Hicks, Jerome H. Krekeler, and Joseph R. Nelli. Apr. 3, 1958. 10p. Contract AT(30-1)-1156. $0.50(OTS).

The laboratory and Pilot Plant evaluation of Algom uranium concentrate is presented in this report. This concentrate meets all FMPC impurity tolerance limits, with the exception of the fluoride and thorium limits. Blending of this concentrate with a high-quality material will be necessary to meet the fluoride tolerance limit. The thorium tolerance limit can be met by the addition of phosphate as required for thorium-containing uranium concentrates. Digestion and extraction tests indicate that this concentrate should give acceptable performance when processed under the suggested conditions. That is, with the exception of a higher pulse amplitude, the standard operating conditions should be used. (auth)

12336 WAPD-T-275
Westinghouse Electric Corp. [Atomic Power Div., Pittsburgh].
TECHNIQUES FOR THE PREPARATION OF UO_2 COMPACTS FOR MICROSCOPIC EXAMINATION. F. M. Cain, Jr. [nd]. 6p. $1.80(ph OTS); $1.80(mf OTS).

The proper application of the procedures permits microscopic examination and photography with vertical illumination of such compact characteristics as porosity size and shape, grain size and shape, and additional phases. Lineal microscopic analysis of the volume percent of pores or phases can also be made using a Hurlbut counter. Sintered UO_2 compacts have a tendency to smear during polishing in a manner similar to that of some metals. It has been observed that as-polished surfaces in most cases appear scratch-free only to have numerous scratches appear after etching has dissolved the smeared material. Scratch-free etched surfaces can be obtained by repeated repolishing and re-etching. Open porosity determination by microscopic means is of particular interest. Attempts to hydrostatically inject Kelon containing phosphorescent and fluorescent dyes into open porosity of compacts and then examine with ultraviolet or some suitable illumination have not been too successful. Remote metallography can be performed on UO_2 compacts by slight modifications of the procedures. The techniques are also applicable to UO_2 powders. (auth)

12337 WIN-90
National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.
PREPARATION OF DENSE, METAL-GRADE UF_4 FROM ORES AND CONCENTRATES. H. G. Petrow, R. J. Allen, and P. J. Magno. May 15, 1958. 64p. Contract AT(49-6)-924. $10.80(ph OTS); $3.90(mf OTS).

In a process for the preparation of dense, metal-grade UF_4, the sulfuric acid solution of uranium prepared either from ore or concentrate is treated with a kerosene solution of an amine, the uranium extracted, then stripped from the solvent into hydrochloric acid.

Hydrofluoric acid and cupric sulfate are added to the pregnant strip solution and UF_4 precipitated by bubbling SO_2 through the hot solution. (J.R.D.)

12338

THE NATURE OF URANYL 8-QUINOLINOLATE. E. P. Bullwinkel and Paul Noble, Jr. (Arthur D. Little, Inc., San Francisco). J. Am. Chem. Soc. 80, 2955-8 (1958) June 20.

It is shown that the three moles of 8-quinolinol in the uranyl 8-quinolinolate are coördinated in an equivalent manner and that the acidic nature of this chelate is best represented by the formula $H(UO_2(C_9H_6NO)_3)$, where the anions, $UO_2(C_9H_6NO)_3^{-1}$, are linked together by hydrogen bonding of the uranyl oxygens. The uranyl tri-8-quinolinolate anion is shown to be stable in alkaline solutions and to form stable salts with cations, such as Na^+, R_4N^+, and $(C_6H_5)_4As^+$. The absorption spectra of aqueous alkaline solutions of the uranyl tri-8-quinolinolate anion and chloroform solutions of the tetraphenylarsonium salt of this anion are reported. The chemical behavior of the uranyl di-8-quinolinolate is reported and discussed with respect to its possible structure. (auth)

12339

THE SOLVENT EXTRACTION OF URANIUM(VI) FROM CARBONATE SOLUTIONS. W. E. Clifford, E. P. Bullwinkel, L. A. McClaine, and Paul Noble, Jr. (Arthur D. Little, Inc., San Francisco). J. Am. Chem. Soc. 80, 2959-61(1958) June 20.

The solvent extraction of uranium(VI) from carbonate solutions has been obtained by means of the formation of a complex salt with 8-quinolinol and a quaternary ammonium ion. The extraction is based upon the novel uranyl chelate $UO_2(C_9H_6ON)_3^-$, formed with 8-quinolinol. The structure of this uranyl chelate has been discussed previously. The distribution ratios D_a^0 increase as the pH is varied from 10 to 12.5. (auth)

12340

PHASE EQUILIBRIA IN THE SYSTEMS $NaF-ZrF_4$, UF_4-ZrF_4 AND $NaF-ZrF_4-UF_4$. C. J. Barton, W. R. Grimes, H. Insley, R. E. Moore, and R. E. Thoma (Oak Ridge National Lab., Tenn.). J. Phys. Chem. 62, 665-76(1958) June.

Equilibrium diagrams for the binary systems UF_4-ZrF_4 and $NaF-ZrF_4$ and the ternary system $NaF-ZrF_4-UF_4$ described in this paper are based on data obtained by thermal analysis, differential thermal analysis, equilibration of small samples followed by quenching, visual observations of phase changes and filtration experiments. Phase boundaries were established for the temperature interval between liquidus temperatures and about 300°. UF_4 and ZrF_4 form a complete series of solid solutions with the minimum melting temperature at 765° for the solution containing 77 mole % ZrF_4. The $NaF-ZrF_4$ system contains the compounds $3NaF \cdot ZrF_4$ and $7NaF \cdot 6ZrF_4$ which melt congruently, the compounds $5NaF \cdot 2ZrF_4$, $2NaF \cdot ZrF_4$ and $3NaF \cdot 4ZrF_4$ which melt incongruently, and the subsolidus compound $3NaF \cdot 2ZrF_4$. A metastable phase has been identified as $NaF \cdot ZrF_4$. The $3NaF \cdot ZrF_4-3NaF \cdot UF_4$ and the $7NaF \cdot 6ZrF_4-7NaF \cdot 6UF_4$ joins in the ternary system are complete solid solution series. Liquidus temperatures decrease with increasing UF_4 concentration in the former and with decreasing UF_4 concentration in the latter series. All of the stable binary compounds except the subsolidus phases $3NaF \cdot 2ZrF_4$ and $NaF \cdot 2UF_4$ have primary phase areas in the ternary diagram. The system contains neither ternary compounds nor ternary eutectics. (auth)

12341

SOLID-LIQUID EQUILIBRIA OF THE SYSTEM URANIUM HEXAFLUORIDE-CHLORINE TRIFLUORIDE. W. S. Wendolkowski and E. J. Barber (Union Carbide Nuclear Co., Oak Ridge, Tenn.). J. Phys. Chem. 62, 750-2(1958) June.

The solid-liquid equilibria of the UF_6-ClF_3 system were investigated in the entire range of compositions from 0 to 100 mole % UF_6. The techniques of Skau were used but modified to ensure equilibrium during the melting and freezing cycles. (J.R.D.)

12342

SOLUBILITY PRODUCTS OF URANYL ARSENATES. V. G. Chukhlantsev and A. K. Sharova (Kiev State Univ.). Zhur. Neorg. Khim. 1, No. 1, 36-41(1956). (Translated from Referat. Zhur. Khim. No. 2, 1957, Abstract No. 3747.)

By the isothermal method data were secured at 20° on the solubility of uranyl arsenates UO_2MAsO_4 (M = H, NH_4, K, Li, and Na) in dilute solutions of nitric and sulfuric acid. By utilizing previously derived equations, a determination was made of the solubility products of the arsenates $[UO_2^{2+}]\,[M^+]\,[AsO_4^{3-}]$, which are (at 20°): 1.71×10^{-24} (M = NH_4), 2.52×10^{-23} (M = K), 1.35×10^{-22} (M = Na), 1.52×10^{-19} (M = Li), and 3.17×10^{-11} for $[UO_2^{2+}]\,[HAsO_4^{2-}]$.

Waste Disposal

12343 CF-57-2-20(Del.)

Oak Ridge National Lab., Tenn.

COMPILATION AND ANALYSIS OF WASTE DISPOSAL INFORMATION. E. D. Arnold, ed. Mar. 12, 1957. Decl. with deletions Mar. 13, 1957. 295p. Contract [W-7405-eng-26]. $6.00(OTS).

A summary of waste processing, treatment, and disposal information as extracted from many documents on the various aspects of the general problem is measured. The material in this report is intended to serve as background for a program proposal at ORNL covering waste processing for fission product recovery, waste treatment and handling, and ultimate disposal of high-level, intermediate-level, and low-level radioactive wastes. In addition to an introduction to the complex of problems in waste treatment and handling, a summary of various ultimate disposal schemes, and related studies, the report catalogs information papers on phases of: waste solution characteristics; economics; predictions of activity and volume buildup in a nuclear power economy; potential health hazards of fission and transmutation products; waste storage, decay, and shipment prior to ultimate disposal; fission product recovery processes and utilization; treatment and disposal of intermediate- and low-level wastes; reviews of engineering studies of problems at existing processing plant waste disposal sites; disposal of wastes in tanks; disposal of wastes in deep wells; disposal of wastes in salt-domes, underground formations, and the ocean; self-sintering at elevated temperatures as a method of ultimate disposal; and a master reference list of pertinent documents. (auth)

12344 CF-57-6-23

Oak Ridge National Lab., Tenn.

THE DISPOSAL OF POWER REACTOR WASTE INTO DEEP WELLS. Wallace de Laguna and J. O. Blomeke. June 13, 1957. 47p. Contract W-7405-eng-26. $7.80 (ph OTS); $3.30(mf OTS).

Disposal of wastes from the processing of solid fuel

elements and from solid blanket elements is discussed. The subjects considered include extraction of uranium by several methods, the removal of element jackets, the treatment of uranium–zirconium fuel elements, disposal into deep wells, the hydraulics of wells, thermal considerations of disposal aquifers regional hydrology, potential deep-well disposal areas in the U. S., and the cost of disposal. (J.R.D.)

ENGINEERING

12345 AECU-3771

Franklin Inst. Labs. for Research and Development, Philadelphia.

THE INFLUENCE OF THE MOLECULAR MEAN FREE PATH ON THE PERFORMANCE OF HYDRODYNAMIC GAS LUBRICATED BEARINGS. Interim Report. Albert Burgdorfer. June 1958. 32p. Sponsored by AEC and ONR under Contract Nonr-2342(00). (I-A2049-2). $4.80(ph OTS); $2.70(mf OTS).

A modified Reynolds equation is derived for gas-lubricated hydrodynamic bearings operating under "slip flow" conditions. Closed analytical solutions are given for a Rayleigh-type step-bearing and an inclined plane slider bearing for the case of two-dimensional flow. The influence of the molecular mean free path on the performance of bearings of arbitrary form is obtained by means of a small parameter, perturbation technique. (auth)

12346 AECU-3773

Franklin Inst. Labs. for Research and Development, Philadelphia.

ANNUAL REPORT ONR PROJECT A-2049. Interim Report. Dudley D. Fuller. July 15, 1958. 27p. Sponsored by AEC and ONR under Contract Nonr-2342(00). (I-A2049-3). $4.80(ph OTS); $2.70(mf OTS).

The objective of this program is to conduct a broad basic program of analytical and experimental research into the fundamental behavior of gas-lubricated bearings and to establish general design criteria for these bearings. The work to date has included both theoretical and experimental phases of hydrodynamic and hydrastatic lubrication phenomena, supplemented by a digital computer program. (W.L.H.)

12347 CF-58-5-110

Oak Ridge National Lab., Tenn.

METALLURGICAL EXAMINATION OF VALVE TRIM FROM HRP DUMP VALVE TEST LOOP. F. W. Cooke. May 28, 1958. 20p. Contract [W-7405-eng-26]. $3.30 (ph OTS); $2.40(mf OTS).

An investigation of trim from the HRP Dump Valve Test Loop revealed that performance improved with increasing poppet hardness. From this it was hypothesized that deformation of softer poppets increased the poppet-seat contact area, thus reducing the closing pressure. The deformation areas of a number of poppets were measured and the closing pressures calculated. A plot of closing pressure against leak rate showed a fair correlation and tends to support the hypothesis. (auth)

12348 ISC-978

Ames Lab., Ames, Iowa.

SEMI-ANNUAL SUMMARY RESEARCH REPORT IN ENGINEERING FOR JULY–DECEMBER 1957. Mar. 10, 1958. 31p. Contract W-7405-eng-82. $1.00(OTS).

Research has been completed on developing an industrial process for recovering Th, rare earths, and U from monazite sands. It was found that only 25 to 35% of the Ce^{3+} could be oxidized to Ce^{4+} in a resonable length of time in a 14 to 15N HNO_3 solution containing 0.15 to 0.20M of Ce per liter. Niobium, Y, and Ta were tested as container materials for various eutectics at high temperatures. (For preceding period see ISC-904.) (W.L.H.)

12349 NP-6796

Wyandotte Chemicals Corp., Wyandotte, Mich. and Illinois. Univ., Urbana.

SYNTHESIS AND EVALUATION OF HIGH TEMPERATURE STABLE AND NUCLEAR RADIATION STABLE METAL-CYCLOPENTADIENYL FLUIDS. Quarterly Progress Report No. 4 Covering Period March 15, 1958 to May 31, 1958. June 30, 1958. 33p. Project Nos. 8(1-7331) and MIPR 346-1. Contract AF33(616)-5053.

In a search for dielectric materials and fluids suitable for use as high-temperature hydraulic fluids and lubricants three new siloxanylferrocenes were synthesized: 1,1′-bis(5-phenylhexamethyltrisiloxanyl)-ferrocene, 1,1′-bis(7-phenyloctamethyltetrasiloxanyl)-ferrocene, and crude 1,1′-dimethyl-x,x′-bis(3-phenyltetramethyldisiloxanyl)-ferrocene. New intermediates prepared during these syntheses included 1-cyclopentadienyl-5-chlorohexamethyltrisiloxane, (methylcyclopentadienyl) dimethylchlorosilane, 1-cyclopentadienyl-7-phenyloctamethyltetrasiloxane, and 1-(methylcyclopentadienyl)-3-phenyltetramethyldisiloxane. A potential precursor to polymeric siloxanylferrocenes was synthesized in crude form by conversion of cyclopentadienyldimethylethoxysilane to the corresponding ferrocene. 1,1-Bis(3-phenyltetramethyldisiloxanyl)-ferrocene and 1,1′-bis(5-phenylhexamethyltrisiloxanyl)-ferrocene showed good thermal stability during 10 hr at 690°F under nitrogen. (For preceding period see NP-6551.) (auth)

12350 AEC-tr-3298

STRUCTURAL ELEMENTS OF MODERN REGULATION INSTALLATIONS WITH SPECIAL CONSIDERATION OF APPLICATION TO BENSON BOILERS. J. F. Wehselan. Translated for Oak Ridge National Lab. from Mitt. Ver. Grosskesselbesitzer, No. 43, 241-52(1956). 46p.

The control of Benson Boilers by automatic, semi-automatic, and manual controls is described. A comparison showing the essential differences in the operation of a steam boiler equipped with a fully automatic firing control and of a boiler with a semi-automatic firing control is given. (W.L.H.)

12351

PORTABLE VIBRATION METER. C. H. Erway (Goodyear Atomic Corp., Portsmouth, Ohio). Machine Design 29, No. 18, 108(1957) Sept. 5.

A lightweight vibration survey meter useful in checking rotary-equipment vibration is described. Vibration can be measured at 30 and 60 cycles in an instrument range of 0 to 5 mils. (J.R.D.)

12352

CROSS CONNECTIONS: THEIR PREVENTION AND CONTROL IN THE Y-12 PLANT OF UNION CARBIDE NUCLEAR COMPANY AT OAK RIDGE, TENNESSEE. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 47, Session 35. Gustave J. Angele (Union Carbide Nuclear Co., Oak Ridge, Tenn.). New York, American Institute of Chemical Engineers, 1958. 31p.

This paper deals with the prevention and control methods used to protect the filtered water supply of the

Electromagnetic Separation Plant in Oak Ridge, Tennessee. As defined by Babbitt and Doland in their fifth edition of Water Supply Engineering, " A cross connection is any physical connection, either direct or indirect, that will permit or may possibly permit the flow of nonpotable water into a conduit or receptacle containing potable water." (A.C.)

Heat Transfer and Fluid Flow

12353 AERE-CE/R-2497
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
TWO PHASE FLOW IN GAS-LIQUID SYSTEMS: A LITERATURE SURVEY. J. A. R. Bennett. Mar. 1958. 58p. $1.44(BIS).

A review is presented of the published literature (approx. to Dec. 1957) concerning the hydrodynamics of two phase gas-liquid flow with regard to the methods and accuracy of predicting pressure drop, liquid holdup, etc. Particular emphasis was placed on the annular flow pattern. (auth)

12354 AERE-R/R-2395
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
A TECHNIQUE FOR THE 'IN PILE' MEASUREMENT OF THERMAL DIFFUSIVITY. E. C. Firman, F. A. Johnson, and J. R. Findlay. Feb. 1958. 30p.

An account is given of preliminary experiments performed to develop a method for measuring thermal conductivity suitable for in-pile use. A transient method is employed involving the measurement of sinusoidally varying temperature at two points along a rod which is periodically heated at one end. A simple relationship between the thermal diffusivity of the material, the amplitude decrement and the velocity of the temperature wave which exists for semi-infinite rods is shown to hold for specimens whose length is greater than a calculated minimum value. Details are given of an apparatus built and tested out-of-pile and some consideration is given to modifications necessary for in-pile versions. (auth)

12355 BW-5423
Babcock and Wilcox Co. Research Center, Alliance, Ohio.
HEAT TRANSFER TEST OF ZIRCONIUM ALLOY FLAT PLATES BEFORE AND AFTER CORROSION. John A. Speeds. Feb. 22, 1954. Decl. June 5, 1958. 36p.

The tests conducted were primarily concerned with heat transfer through zirconium alloys at heat fluxes of 500,000 Btu/(hr)(ft^2), and the effect of corrosion films on the over-all heat transfer coefficient. The decrease in the over-all heat transfer coefficients resulting from the corrosion films on most Zircaloy plates tested was less than 5% with a maximum of 11%. The conditions under which the corrosion film is formed affects the change in over-all heat transfer. Test reproducibility was within ± 5%. From a statistical analysis of the results, two constants have been derived with which surface temperature increases or changes in the over-all heat transfer coefficient due to corrosion films produced by either 680°F water or 750°F steam can be predicted. The over-all heat transfer coefficients after corrosion can be predicted as accurately as the over-all heat transfer coefficient of "new" Zircaloy plates. (auth)

12356 CF-58-4-23
Oak Ridge National Lab., Tenn.
PRELIMINARY REPORT OF FUSED SALT MIXTURE NO. 130 HEAT TRANSFER COEFFICIENT TEST. J. C. Amos, R. E. MacPherson, and R. L. Senn. Apr. 2, 1958. 47p. Contract [W-7405-eng-26]. $7.80(ph OTS); $3.30(mf OTS).

Heat transfer data are presented over a Reynolds Number range of 400 to 8000 for the test fused salt Mixture No. 130 (62 mol % LiF–37 mol % BeF_2–1 mol % UF_4) and for a calibrating used salt Mixture No. 30 (50 mol % NaF–46 mol % ZrF_4–4 mol % UF_4) flowing inside round heat exchanger tubes. A preliminary equation is developed for predicting shell-side heat transfer coefficients for liquid metal in turbulent, longitudinal flow over a square tube array having a pitch/diameter ratio of 1.165. An experimental value of the specific heat of fused salt Mixture No. 130 is also determined from the test data. (auth)

12357 CF-58-5-67
Oak Ridge National Lab., Tenn.
A PRELIMINARY INVESTIGATION OF AIR FILM HEAT-TRANSFER COEFFICIENTS FOR FREE- AND FORCED-VORTEX FLOW WITHIN TUBES. N. D. Greene and W. R. Gambill. May 23, 1958. 15p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The results of an experimental investigation of heat transfer to a high velocity, vortex air flow are presented. Heat-transfer coefficients have been observed for vortex flow in tubes which are larger than those for linear turbulent flow at a given flow power dissipation per unit surface area. Comparisons are drawn between air in free- and forced-vortex flow within tubes having length-to-diameter ratios of 11.7 and 20.0, respectively, and linear turbulent flow in identical tubes. For the observed range of flow power dissipation, the free-vortex flow system is characterized by a heat-transfer coefficient one to two hundred per cent larger than that calculated for linear turbulent flow at the same pumping power. The forced-vortex flow system exhibits a superiority over linear flow only at high flow powers. (auth)

12358 UCRL-5214
California. Univ., Livermore. Radiation Lab.
STABILITY OF THE INTERFACE BETWEEN TWO IMMISCIBLE LIQUIDS OF UNEQUAL VISCOSITY IN A POROUS SOLID. Ray E. Kidder. May 7, 1958. 7p. Contract W-7405-eng-48. $0.50(OTS).

The stability of the interface between two immiscible fluids moving at a uniform rate through a porous medium is investigated. The conditions for stability are derived, and the rate of growth of instabilities of specified wavelength is obtained. The expression for the rate of growth of instability is similar in form to that obtained by Taylor for the case of uniformly accelerated incompressible liquids, but the growth rate is found to be inversely proportional to the wavelength rather than inversely proportional to the square root of the wavelength. (auth)

12359 WAPD-TH-391
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
TRANSIENT BURNOUT AND PRESSURE DROP STUDIES. S. J. Green. Jan. 27, 1958. 12p. $3.30(ph OTS); $2.40(mf OTS).

A summary of the status of various phases of the program (temperature measurement, pressure measurement, flow measurement, current, voltage) is presented and discussed. (T.R.H.)

12360

INVESTIGATION OF HEAT TRANSFER IN BOILING WATER IN AN ANNULAR SPACE AT MODERATE THERMAL FLOWS. I. I. Chernobyl'skiy and Yu. M. Tananayko. Izvest. Kiev. Politekh. Inst. 17, 61-74 (1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 6334.)

The values of the heat transfer coefficient of water boiling in annular slits are obtained. The problem of the influence of the width of the slit on the coefficient of heat transfer at moderate thermal loads is investigated, and the process of boiling of the water in the slit is observed visually. Equations for the heat transfer coefficient are also obtained.

12361

HEAT TRANSFER FROM A DOWNWARD FLOWING FILM OF BOILING WATER. Yu. M. Tananayko. Izvest. Kiev. Politekh. Inst. 17, 75-82(1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 6333.)

When water boils in a flowing film with thickness $\delta = 0.25$ mm, one observes two modes of heat transfer, in which the heat transfer coefficient may be calculated from the following empirical equations: $\alpha_2 = 22q^{0.527}$ and $\alpha_2 = 8.15q^{0.6}$ (q is the specific thermal load). It was established that upon boiling in a film ($\delta = 0.25$ mm) α_2 is 10 to 15% lower than in an ordinary tube. This is caused by the particular conditions in the flowing film (action of gravity forces, surface tension, supporting action of the moving steam, etc.).

12362

CALCULATION OF SUPERSONIC FLOW PAST AN AXIALLY SYMMETRIC CYLINDER. Martha W. Evans and Francis H. Harlow (Los Alamos Scientific Lab., N. Mex.). J. Aeronautical Sci. 25, No. 4, 269-70(1958) Apr.

A numerical calculation was used to determine the axially symmetric flow pattern about a flat-nosed cylinder moving parallel to its axis at Mach Number $M_\infty = 1.58$ along the axis of a rigid cylindrical chamber. The approach to steady state was studied in detail for the case in which the cylinder, starting from rest, instantly attained its fixed speed. The air was represented by a nonviscous polytropic gas with specific heat ratio $\gamma = 1.4$, and the calculations were performed on an IBM type 704 computer. (auth)

12363

ON HEAT TRANSFER IN REACTORS. E. Ruckenstein. Studii si cercetari fiz. 7, No. 1, 63-6(1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 6325.)

A study is made of the transfer of heat from the liquid in which the transfer takes place (there is no exchange of substance between the liquid in the external medium, and the temperature and concentration of the various components are independent of the coordinates) and another liquid flowing through a bundle of tubes.

12364

BOILING PRESSURE DROP IN THIN RECTANGULAR CHANNELS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 146, Session 24. N. C. Sher and S. J. Green (Westinghouse Electric Corp.). New York, American Institute of Chemical Engineers, 1958. 41p.

Tests conducted at Bettis Plant have yielded steady-state boiling and non-boiling pressure drop data for water flowing vertically upward in rectangular channels at 2000 and 1100 psia. Available void data, obtained at conditions corresponding to some of the pressure drop tests, have been reviewed, and a technique for incorporating these data in an analysis of pressure drop data has been developed. Preliminary results show that local boiling pressure drop can be treated on exactly the same basis as bulk boiling pressure drop if the necessary void information is available. A procedure has been developed for estimating boiling and non-boiling pressure drops in rectangular channels at 2000 psia independently of the experimental void data. (auth)

12365

TWO-PHASE STEAM–WATER PRESSURE DROPS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 147, Session 24. H. S. Isbin, R. H. Moen, R. O. Wickey, D. R. Mosher, and H. C. Larson (Univ. of Minnesota, Minneapolis). New York, American Institute of Chemical Engineers, 1958. 32p.

Frictional pressure drops for steam–water mixtures have been determined for the following ranges of conditions: pressure, 25 to 1415 psia; total flow rate, 454 to 4350 lb/hr; and quality from about 0.03 to 0.98. The steam–water mixtures were synthesized by mixing steam and water, and pressure drops were measured for adiabatic flow in horizontal pipes, 0.484 and 1.062-in. i.d. Considerable care was taken to insure that the method of mixing did not influence the pressure drop results, and that the pressure measurements were made sufficiently far from both entrance and exit. The data are compared to standard correlations, and a new restricted correlation is suggested which takes into account the pressure and flow rate dependencies. (auth)

12366

REACTOR HEAT TRANSFER. W. B. Hall. London, Temple Press Limited, 1958. 75p.

The Monograph is divided into three sections. The first ideals with the fundamental aspects of connective heat transfer. Wherever possible an analytical treatment of the process has been presented in addition to a statement of the empirical formulas derived from experiment. The second section is devoted to the application of heat transfer data to reactor design. In the final section a number of miscellaneous aspects of reactor heat transfer are dealt with. (W.L.H.)

Materials Testing

12367 AECU-3766

Westinghouse Electric Corp. Research Labs., East Pittsburgh, Penna.

PHOTOELASTIC STUDY OF STRESS IN PERFORATED HEMISPHERICAL CLOSURES FOR A PRESSURE VESSEL. Research Report 100FF996-R1. R. C. Sampson and M. M. Leven. Jan. 9, 1957. 16p. $3.30(ph OTS); $2.40(mf OTS).

Photoelastic "frozen stress" tests were made of perforated hemispherical closures for a pressure vessel. Three different hole patterns were investigated. The "circular" and "square" arrangements of holes showed the highest peak stress, a value of stress + pressure of about 10 being noted in each. In comparison, the "triangular" arrangement of holes yielded a peak value of 8.20. (auth)

12368 CF-57-10-48(Suppl.)

Oak Ridge National Lab., Tenn.

INVESTIGATION OF EFFECT OF SEAL CONFIGURATION ON MIXING FLOW AND RADIATION DAMAGE IN HRT-TYPE CIRCULATING PUMPS. Supplement No. 1.

J. C. Moyers. Jan. 13, 1958. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The effect of seal configuration on the rate of mixing flow between the impeller cavity and the motor cavity of a Westinghouse Model 400 A pump was extended to include a configuration wherein the lower radial bearing acts as a secondary seal. This arrangement increases the life of the motor windings; however, the life of the lower radial and thrust bearings is shortened because of inadequate cooling. (J.E.D.)

12369 NP-6811

Australia. Forestry Commission of New South Wales. Div. of Wood Technology, Sydney.

GAMMA-RAY MEASUREMENT OF DEFECTS IN POLES AND TREES. B. J. J. McHugh and H. E. Booth. [1957]. 13p.

Trees, poles and timbers often carry or develop defects in the form of cavities, gum veins, decayed wood, etc. The non-destructive detection and measurement of such defects using γ-rays from low intensity sources is described. Variations in γ-ray intensity are measured directly to determine presence of defects. Eight possible techniques are discussed and one, the "Equal Intensity" method, is analyzed. The optimum type of γ-ray source for various conditions is determined theoretically. The sources of error and the optimum conditions for accuracy are determined and the results presented for a typical case. Absorption coefficients for the Cs-137 γ-ray are given for four species of wood and various kinds of defective wood. The use of the "Equal Intensity" method in the field is described and the preliminary results obtained on trees and poles are given. (auth)

12370 ORNL-2537

Oak Ridge National Lab., Tenn.

AN INVESTIGATION OF THE STRESSES IN A DISCONTINUITY REGION OF A PRESSURE VESSEL (thesis). B. L. Greenstreet. July 21, 1958. 64p. Contract W-7405-eng-26. $2.00(OTS).

Submitted to Univ. of Tennessee.

A thin-walled cylindrical pressure vessel was held at 1500°F in an inert atmosphere until creep-rupture occurred. The vessel was made of Inconel, and it had a flat-plate head at one end. This configuration yielded high discontinuity stresses in the region of the head-to-shell junction. As the vessel deformed due to creep of the material, its configuration changed. In order to determine the effect of this continual change in configuration upon the stress distribution at the flat-plate head end of the shell, the test was interrupted at various time intervals. The specimen was removed from the furnace, and it was loaded by internal pressure at room temperature. The resulting strains were measured using strain gages, and the corresponding stresses were calculated. In addition to the strain measurements, the dimensions of the vessel were also obtained. Initially, the maximum axial stress in the cylinder which existed where the flat head and cylinder were joined was approximately ten times the circumferential membrane stress. However, the high stresses at the junction of the head and cylinder decreased with creep time, and the vessel failed in a region where the membrane stresses predominated throughout the test. The circumferential strain in this region was approximately twelve percent while it was approximately four percent in the high stress region. (auth)

12371

HIGH-TEMPERATURE FATIGUE TESTING—WITH APPLICATION TO URANIUM. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 133, Session 9. Jack R. Bohn and Glenn Murphy (Iowa State College, Ames). New York, American Institute of Chemical Engineers, 1958. 11p.

Testing of materials, particularly fatigue testing at elevated temperatures, presents difficulties when the material is subject to oxidation. Various methods have been developed for protection of materials to permit an evaluation of their intrinsic properties at temperatures at which oxidation becomes a significant factor. Various test techniques are discussed, and results of extensive tests on uranium at temperatures up to 600°C are given. Two methods of protection, (1) plating and (2) encasing the specimen in a flexible envelop, are considered in particular and equipment for encasement is described. On the basis of the test results obtained on uranium up to 600°C in repeated flexure it is concluded that the encasement method is definitely superior to other techniques of protection. The method of encasement is not time-consuming and the scatter of the test data is reduced markedly in comparison with data from specimens protected by other means. (auth)

Radiography

12372 BRL-678

Ballistic Research Labs., Aberdeen Proving Ground Md.

ULTRA-FAST FLASH X-RAYS FOR MULTIPLE RADIOGRAPHY. Harold I. Breidenbach. Mar. 1949. 25p.

A method for obtaining x-ray flashes having a time duration of the order of one-tenth of a microsecond is given. In addition, three successive tenth microsecond radiographs of the same detonation may be taken on separate films. Included are circuit diagrams, schematics, illustrations, and functional explanations of the main units and their associated equipment. Accompanying the circuit diagrams and schematics are brief functional descriptions. (auth)

Waste Disposal

Refer also to abstract 12169.

12373 HW-40990

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

ADSORPTION CHARACTERISTICS OF LONG SOIL COLUMNS. J. R. McHenry. May 1, 1955. Decl. June 11, 1958. 10p. Contract W-31-109-Eng-52. $1.80 (ph OTS); $1.80(mf OTS).

Information is presented relative to the characteristic adsorption of radioisotopes in a long laboratory soil column treated with a high salt process waste of high activity density. The movement of adsorbed cations in a soil column subjected to prolonged leaching by water also was determined. (A.C.)

12374

GROUND DISPOSAL OF RADIOACTIVE WASTES. C. B. Amphlett (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Atomics and Nuclear Energy 9, 194-7(1958) June.

The problem of waste disposal due to the increase in size and numbers of nuclear power stations, physical factors in site selection, and chemical behavior of wastes in the ground are discussed. (J.E.D.)

MINERALOGY, METALLURGY, AND CERAMICS

12375 SCR-26

Sandia Corp., Albuquerque, N. Mex.

PROBLEMS RELATING TO THE NEED FOR HEAT-TOLERANT MATERIALS IN AERODYNAMIC APPLICATIONS. P. W. Rowe. [Jan. 1957]. [Issued] June 1958. 20p. Contract AT(29-1)-789. $3.30(ph OTS); $2.40(mf OTS).

Presented at American Society for Metals Conference on Heat Tolerant Materials for Aerodynamic Applications, Albuquerque, N. Mex. Jan. 1957.

The need for heat-tolerant materials in aerodynamic applications is discussed on the basis of the temperatures attainable in high-speed flight, the effects of these temperatures upon structural materials, and the problems encountered by the airframe designer as a result of the changes in these structural properties. (auth)

12376

DENSITY MEASUREMENT OF SATURATED SUBMERSED SEDIMENT BY GAMMA-RAY SCATTERING. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 135, Session 5. L. O. Timblin, Jr. (U. S. Dept. of the Interior, Denver). New York, American Institute of Chemical Engineers, 1958. 23p.

Field and laboratory investigations were carried out to investigate the feasibility of using the gamma-ray scattering technique for density measurement to determine the dry density of saturated submersed sediments. An instrument was designed similar to that developed by the Bureau of Reclamation for subsurface soil density measurement. It consists of a probe containing Co^{60} as a source of gamma rays and a self-reading ionization chamber for the detector. A lead cylinder is provided for radiation shielding and weight to drive the probe into the sediment. Laboratory calibration tests were conducted to establish the relationship between the instrument reading and sediment density. The correlation between the results from the instrument and standard methods now employed for field measurement of sediment density was also studied in the laboratory. Two field tests were made to compare the results from the new method with the standard method. As a result of both the laboratory and field tests, it was found that the technique is applicable and that a suitable instrument could be devised satisfactorily to determine under a variety of field conditions the dry density of saturated submersed sediments. (auth)

Ceramics and Refractories

12377 NYO-8085

Carnegie Inst. of Tech., Pittsburgh. Metals Research Lab.

FUNDAMENTAL STUDY OF THE EARLY STAGES OF SINTERING. Annual Report. June 15, 1957. 29p. Contract AT(30-1)-1826. $4.80(ph OTS); $2.70(mf OTS).

During early stage sintering the number of interparticle contact points (the connectivity of the metal surface) remains constant. Meanwhile the metal surface area diminishes, the rate of mass transfer apparently being proportional to the number of particle contacts and to the surface free energy, that is to the surface area in any one example. At the outlet of sintering there is a sharp decrease in density followed by a subsequent and continuing increase in density; this reversal is thought to be associated with a reversal in the proportions of positive and negative curvature of the metal surface. A revision of the particle counting method is presented. (auth)

12378 SCR-42

Sandia Corp., Albuquerque, N. Mex.

PROPERTIES OF PIEZOELECTRIC TITANATES AND ZIRCONATES INCLUDING A DISCUSSION OF THEIR CONTROL AND EVALUATION. T. G. Kinsley and R. D. Wehrle. [May 1956]. [Issued] July 1958. 8p. Contract AT-(29-1)-789. $1.80(ph OTS); $1.80(mf OTS).

Presented at the 1956 Electronic Components Conf., Washington, D. C., May 1956.

This paper is in two parts. The first part reports on the program pursued by Sandia Corporation in a planned effort toward obtaining more uniform and efficient piezoelectric ceramics. The second part discusses specifications and tests used by Sandia to ensure procurement of satisfactory piezoelectric elements. (auth)

12379

APPLICATION OF Fe^{59} AND Cr^{51} IN THE INVESTIGATION OF IRON AND CHROMIUM DIFFUSION IN SPINELS $NiCr_2O_4$ AND $NiAl_2O_4$. I. N. Belokurova and D. V. Ignatov. Atomnaya Energiya 4, 301-2(1958) Mar. (In Russian)

The diffusion parameters of chromium and iron in the oxides $NiCr_2O_4$ and $NiAl_2O_4$ were determined and correlated with the oxidation rate of the alloys. The temperature dependence of the diffusion coefficients are presented graphically. (R.V.J.)

12380

ABOVE 2,500 F, WHAT MATERIAL TO USE? Luther D. Loch (Carborundum Co., Niagara Falls, N. Y.). Chem. Eng. 65, No. 13, 105-9(1958) June 30.

The properties of cermets and refractories and their applications in the chemical industry and in nuclear reactors are discussed. The properties of silicon carbide, boron nitride, graphite, silicon nitride, titanium diboride, zirconium diboride, hafnium diboride, and molybdenum silicide are tabulated. (T.R.H.)

12381

ELASTIC CONSTANTS OF STRONTIUM TITANATE ($SrTiO_3$). Edward Poindexter and A. A. Giardini (Univ of Michigan, Ann Arbor). Phys. Rev. 110, 1069(1958) June 1.

The elastic constants of strontium titanate ($SrTiO_3$) were measured by the compound resonator method. Oriented quartz cylinders were used as drivers to excite the sample cylinders. The measured values for the compliance constants are $s_{111} = 3.3 \times 10^{-13}$ cm^2 dyne^{-1}, $s_{1122} = -0.74 \times 10^{-13}$ cm^2 dyne^{-1}, and $4s_{1212} = 8.4 \times 10^{-13}$ cm^2 dyne^{-1}. The elastic behavior of $SrTiO_3$ is found not to be entirely analogous to that of $BaTiO_3$. (auth)

Corrosion

12382 BMI-1271

Battelle Memorial Inst., Columbus, Ohio.

AN INVESTIGATION OF URANIUM CORROSION IN 100 C WATER AND 200 C STEAM AT ATMOSPHERIC PRESSURE. Oliver M. Stewart, Warren E. Berry, Paul D. Miller, Dale A. Vaughan, John B. Schroeder,

Frederick W. Fink, and Charles M. Schwartz. June 19, 1958. 18p. Contract W-7405-eng-92. $0.75(OTS).

Material balance in atmospheric-pressure water and steam corrosion of uranium have been studied by examination of the phase composition and valence state of the corrosion product and by hydrogen-evolution measurements. The corrosion rates in atmospheric-pressure steam above 100°C are lower than those obtained in tests carried out in water with a hydrogen overpressure. The atmospheric-pressure-water corrosion product was found to be two phase: an oxygen-rich oxide, $UO_{2.2}$, and uncorroded metal particles. No hydride phase was detected, in contrast to previously reported evidence for hydride in uranium corrosion. The differences are explained on the basis of hydrogen pressure in the reaction vessel. (auth)

12383 CF-58-6-74

Oak Ridge National Lab., Tenn.

HRP IN-PILE CORROSION TEST LOOPS, OPERATION OF IN-PILE LOOP L-2-19. R. A. Lorenz. June 19, 1958. 21p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Loop L-2-19 operated in HB-2 of the LITR for 1148.9 hours of circulation and 2705 Mwhr of LITR operation. The solution contained 0.17 m enriched UO_2SO_4, 0.02 m $CuSO_4$, 0.12 m excess H_2SO_4, and 0.20 m Li_2SO_4 in H_2O. The main stream was 280°C and the pressurizer 295°C. There was no unusual difficulty during loop operation. A revised loop sample procedure gave better flushing of the sample lines. Four valves failed due to severe corrosion and fracturing of the 420 SS stems. I-131 was not detected in a sample of gas taken from the gas hold-up tank. The run was terminated when the circulating pump failed. (auth)

12384 CF-58-6-92

Oak Ridge National Lab., Tenn.

TABULAR SUMMARY OF ZIRCALOY-2 IN-PILE ROCKING AUTOCLAVE CORROSION DATA. R. J. Davis. June 18, 1958. 12p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A tabular résumé of the data from 37 in-pile Zircaloy-2 rocking autoclave corrosion experiments performed since August 1954 is presented. Included are data concerning solutions used on the specimens before and after the reactor exposure, sample treatment prior to irradiation, conditions during exposure, data on oxygen consumption and specimen weight losses, and miscellaneous data. (J.R.D.)

12385 NMI-1157

Nuclear Metals, Inc., Cambridge, Mass.

OXIDATION RESISTANCE OF NIOBIUM-BASE ALLOYS. H. J. Cleary. July 13, 1956. Decl. July 21, 1958. 26p. Contract AT(30-1)-1565. $4.80(ph OTS); $2.70 (mf OTS).

A program has been under way for the development of a niobium-base alloy with oxidation-resistant properties above 2000°F (1093°C); a 1000-fold improvement over the oxidation resistance of unalloyed niobium at these temperatures was desired. A considerable number of binary and ternary niobium-base alloys have been investigated for oxidation resistance at 980°C. The following alloying elements were found to be somewhat beneficial when added in sufficient amounts to niobium: Al, Cr, Ti, Sn, and Co. Addition of other binary elements lowered the oxidation resistance of niobium: V, Cu, Mg, U, Zn, and Si. Elements which had little effect on the oxidation rate of the base metal were Be, Ni, Fe, and Mn. Ternary alloys with better oxidation resistance than unalloyed niobium were: Nb–20 wt. % Cr–6 wt. % Al, Nb–10 wt. % Cr–2 wt. % Al, Nb–20 at. % Ti–5 at. % Be, and Nb–25 at. % Ti–10 at. % Al. A ternary alloy with low resistance was Nb–25 at. % Cr–5 at. % Be. The best of these binary and ternary alloys (Nb–25 wt. % Ti, Nb–20 at. % Ti–5 at. % Be, Nb–25 at. % Ti–10 at. % Al) showed less than a 40-fold improvement in the oxidation rate of unalloyed niobium at 980°C (1800°F). (auth)

12386 WAPD-TM-123

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

THE CORROSION OF ZIRCALOY BASE FUEL ALLOYS IN HIGH TEMPERATURE WATER. Stanley Kass. Jan. 1958. 26p. Contract AT-11-1-GEN-14. $0.75 (OTS).

The corrosion of Zircaloy-base fuel alloys containing 3 to 8 wt. % uranium with and without the addition of boron is characterized by the initial formation of a protective oxide, often followed by a breakdown of the protective film and general spalling. In general, the corrosion resistance decreases with increasing uranium concentration. Zircaloy-2 base fuel alloys containing 5 to 8 wt. % uranium exhibit optimum corrosion resistance in the as-fabricated condition. Zircaloy-3 base fuel alloys containing 3 to 8 wt. % uranium exhibit best corrosion resistance after quenching from the high-temperature (950°C) field. The addition of small amounts of boron to the Zircaloy-2 or Zircaloy-3 base fuel alloys markedly affects the response of corrosion resistance with prior thermal history. Zircaloy-2 uranium–boron alloys exhibit the best corrosion properties after fast cooling from high (950°C) temperature, while the low-temperature (550°C) treatment results in the most corrosion resistant forms of the Zircaloy-3–uranium–boron alloys. (auth)

12387 AEC-tr-3302

CORROSION OF STEELS BY HOT ALKALINE SOLUTIONS UNDER PRESSURE. K. L. Tseitlin, et al. Translated for Westinghouse Electric Corp. Bettis Plant. from Khim. Prom., No. 7, 438-40(1954). 7p.

Under conditions of combined action of a 20% solution of caustic soda, a temperature of about 400°, and a pressure of 300 atm., it was found that: (1) Cr–Ni and Cr–Ni–Mo steels of the type EI-417 and EI-403, in a non-stressed condition, possess a reasonable stability (the corrosion is less than 0.2 g/m^2hr); steels EI-448 and EY1T are reasonably stable (the corrosion does not exceed 1.2 g/m^2hr). Carbon steels ST-3, Kh5M, and 5% nickel steel are only slightly stable (corrosion is 4 to 9 g/m^2hr). (2) Cr–Ni and Cr–Ni–Mo steels of the type EY1T, EI-448, EI-403, EI-417, under a state of stress and the above conditions, are quite prone to develop cracks. In the autoclaves cracks appeared after a few hours of exposure. (3) Carbon steel subjected to stress is less inclined towards the formation of cracks than is Cr–Ni and Cr–Ni–Mo steel. As a result of the tests which were carried out it was found that non-stressed chromium–nickel and chromium–nickel–molybdenum steels, while chemically stable during processes involving hot alkaline solutions, are nevertheless inclined towards the formation of cracks under conditions of stress. On the other hand, carbon steel which corrodes only slightly in hot alkaline solutions is less prone to form cracks under a state of stress. (auth)

12388

THE ACTIVATION AND INHIBITION OF CORROSION OF METALS BY METALLIC CATIONS. W. Roger

Buck, III and Henry Leidheiser, Jr. (Virginia Inst. for Scientific Research, Richmond). Corrosion 14, 308t-12t(1958) July.

A broad survey was made of the corrosion of aluminum, cadmium, copper, gold, iron, magnesium, manganese, molybdenum, nickel, silver, tin, titanium, tungsten, zinc, and zirconium by fruit and mineral acids at the boiling point in the presence of low concentrations of foreign metallic ions. As a general rule, cations of the elements in groups II through V in the periodic table showed the highest tendency to decrease the rate of corrosion and the transition elements in group VIII showed the highest tendency to increase the rate of corrosion. The relative effectiveness of the ions was a function of the metal undergoing corrosion and the acid used. As far as could be determined, all the metallic ions which affected the corrosion rate did so by virtue of plating out on the metal surface. However, the adherence of the depositing metal did not appear to be related to the effect of the depositing metal on the corrosion rate. The activators and inhibitors altered the corrosion rate at concentrations as low as 10^{-7} to 10^{-5} M. These concentrations are equivalent to 0.1 to 10 atomic layers of the added metal if it is assumed that all the ions end up on the metal surface. In many cases when the added ion was a neighbor in the periodic table of the metal undergoing corrosion, an unusual rate of corrosion was obtained. As examples of this fact, copper was an effective inhibitor for the corrosion of nickel by hydrochloric acid and antimony was an effective activator for the corrosion of tin. (auth)

12389

CORROSION OF STEEL IN WATER BY VARIED RATIOS OF DISSOLVED GASES. J. Wade Watkins and G. W. Kincheloe (Bureau of Mines, Bartlesville, Okla.). Corrosion 14, 341t-4t(1958) July.

Laboratory tests were made to determine the corrosivity of steel in water containing varying concentrations of dissolved gases. Tests were conducted with varied ratios of free carbon dioxide to both oxygen and hydrogen sulfide, with the concentration of one gas maintained constant throughout a series of tests and the concentration of the other gas varied by increments to values approaching saturation. Corrosion rate as a function of time in the system was determined at time intervals to a maximum of 984 hours exposure. Results indicated that corrosion caused by oxygen and free carbon dioxide increased almost in direct proportion to the concentration of dissolved oxygen. The greatest potential corrosion in a water-injection system might be expected from water saturated with air and containing high concentrations of dissolved free carbon dioxide. The inhibiting action of hydrogen sulfide by the formation of protective coatings was manifested almost throughout the entire range of carbon dioxide-hydrogen sulfide ratios. In the time versus corrosion tests, the corrosion rate was fairly linear with time up to about 72 hours; it then increased, and again assumed a nearly linear relationship from about 140 hours to 984 hours exposure. (auth)

12390

MECHANISM OF INHIBITING EFFECT OF HYDROFLUORIC ACID IN FUMING NITRIC ACID ON LIQUID-PHASE CORROSION OF ALUMINUM AND STEEL ALLOYS. David M. Mason (Stanford Univ., Calif.) and John B. Rittenhouse (California Inst. of Tech., Pasadena). Corrosion 14, 345t-7t(1958) July.

The inhibiting effect of hydrofluoric acid in fuming nitric acid on the liquid-phase corrosion of aluminum alloys and iron alloys is found to be dependent primarily on the formation of a tenacious insoluble fluoride compound of aluminum or iron, respectively, on the surface of the metal. This mechanism is discussed in relation to: (1) solubility data for several pertinent compounds, (2) analysis of passivating coating on metal samples, and (3) correlation of solubility data with extent of corrosion of metal. The role diffusion plays in the passivation process is discussed briefly. Most of the measurements were made using fuming nitric acid containing 14 wt. percent NO_2 and 3 wt. percent H_2O, acid of this composition being thermally very stable. (auth)

12391

THE BEHAVIOR OF STEELS IN HYDROGEN SULFIDE ENVIRONMENTS. L. W. Vollmer (Gulf Research and Development Co., Pittsburgh). Corrosion 14, 324t-8t (1958) July.

Spontaneous cracking of steels in deep high-pressure condensate wells producing gas containing hydrogen sulfide has been a subject for considerable investigation during the past seven or eight years. This paper presents: (1) a definition and possible mechanisms for sulfide-stress cracking of steels, (2) the methods currently being used to establish the susceptibility of steels to this phenomenon, (3) a brief summation of the significant developments from research on the problem, and (4) the measures that are currently indicated to minimize the possibilities of such failures in steel equipment. The term "sulfide-stress cracking" is preferred to the commonly used "sulfide corrosion cracking" since the phenomenon is stress dependent. The susceptibility of most constructural steels to sulfide-stress cracking can be minimized, if not eliminated, by appropriate heat treatment which must include tempering at a temperature not less than 1150 F and by limiting the maximum mechanical properties to predetermined levels. When the use of high strength metals is unavoidable, certain nonferrous alloys, which thus far have indicated a high degree of insensitivity to the phenomenon, are suggested. (auth)

12392

SURFACE AREA RELATIONSHIPS IN POLARIZATION AND CORROSION. Milton Stern (Union Carbide Corp., Niagara Falls, N. Y.). Corrosion 14, 329t-32t(1958) July.

The polarization behavior of surfaces containing regions which exhibit different overvoltage parameters for the same reaction are described. Also, the effect of cathode area fraction on corrosion potential and corrosion rate is considered for a corroding surface controlled by activation polarization. It is shown that the corrosion potential and corrosion rate are most sensitive to area changes when the surface is largely cathode or anode. The corrosion current reaches a maximum when the surface is equally divided into anodic and cathodic regions. (auth)

Geology and Mineralogy

12393

SIMPLOTITE, A NEW QUADRIVALENT VANADIUM MINERAL FROM THE COLORADO PLATEAU. M. E. Thompson, C. H. Roach, and Robert Meyrowitz (U. S. Geological Survey, Washington). Am. Mineralogist 43, 16-24(1958) Jan.–Feb.

Simplotite, $CaV_4O_9 \cdot 5H_2O$, is a new calcium tetravanadite that has been found in five vanadium–uranium mines on the Colorado Plateau. It occurs as dark-green micaceous plates and as hemispherical aggregates of

plates, coating fracture surfaces in sandstone impregnated by relatively unoxidized vanadium and uranium minerals. Simplotite represents an early stage in the oxidation sequence of the vanadium ore. It is associated with duttonite, melanovanadite, abundant crystals of hexagonal native selenium, and an undescribed vanadium oxide. Simplotite is biaxial negative, 2V about 25°, dispersion r > v, weak and crossed, $\alpha = 1.705 \pm 0.002$, $\beta = 1.767 \pm 0.002$, $\gamma = 1.769 \pm 0.002$. X = b yellow, Y green, $Z \wedge c \sim -58°$ green. The measured specific gravity is 2.64 ± 0.002. A chemical analysis of material from the Peanut mine showed, in per cent: CaO, 11.6; V_2O_4, 67.7; V_2O_5, 0.5; H_2O, 18.4; insoluble, 0.5; total, 98.7. Simplotite is monoclinic, pseudotetragonal; the space group $A2/m(C_{2h}^3)$, $Am(C_s^3)$, or $A2(C_2^3)$; a = 8.39 ± 0.03 A, b = 17.02 ± 0.05 A, c = 8.37 ± 0.03 A, $\beta = 90°25' \pm 5'$; a : b : c = 0.4929 : 1 : 0.4918; cell contents $4[CaV_4O_9 \cdot 5H_2O]$; calculated specific gravity 2.65. The new mineral is named for J. R. Simplot of the J. R. Simplot Mining Company of Boise, Idaho, former owner of the Peanut mine. (auth)

12394

THE OCCURRENCE OF URANIUM IN CENTRAL GERMANY. F. Schumacher. Atomwirtschaft 3, 224-9(1958) June. (In German)

The uranium fields in central Germany represent by far the largest German uranium deposits. Next to the French uranium fields they are the most important ones in Europe. Their main distribution centers are the crystalline massifs of the Erzgebirge, its southwesterly continuation, the Fichtelgebirge, which belongs to the Federal Republic, and the Riesengebirge. In spite of its general wealth in ores the uranium deposits in the Harz mountains are of very little significance. (auth)

12395

ON THE EFFECT OF EXTERNAL CONDITIONS ON RADIOACTIVE DISINTEGRATION. V. I. Baranov (Academy of Sciences, USSR). Byull. Komis. po Opredel. Absolyut. Vozrast. Geol. Form. Akad. Nauk S.S.S.R. 1, 77-9(1955). (Translated from Referat. Zhur. Khim. No. 1, Abstract No. 699.)

The work of many authors have shown that the effect of external conditions, e.g., temperature, pressure, magnetic field, cosmic radiation, etc., has no practical significance in the determination of geologic age within the limits of error of the radioactive methods applied.

12396

EXPLORATION FOR URANIUM, WHITE CANYON DISTRICT SAN JUAN COUNTY, UTAH. Harry M. Dahl and Walter MacDonald, Jr. (U. S. Atomic Energy Commission, Grand Junction, Colo.). Mines Mag. 74-8(1957) Mar.

The White Canyon uranium district, in San Juan County, southeast Utah, is described. A brief history of the mining activities is presented. The general geology of the region, occurrence of uranium, and exploration techniques are discussed. (W.D.M.)

12397

URANIUM IN PHOSPHORITES. J. Burek. Przeglad. Geol. No. 4, 158-9(1956). (Translated from Referat. Zhur. Khim. No. 1, Abstract No. 705.)

The U content in phosphorites is on the average, 0.010% and attains 0.127% in individual cases. The concentration of U increases in proportion to the content in P_2O_5, CO_2, F, and organic material; this leads to the supposition that U in phosphorites is combined with acid phosphate minerals. The following mechanisms for the accumulation of U in phosphorites are proposed: (1) deposition by sea water together with P_2O_5; (2) adsorption of U by phosphate deposits; and (3) adsorption of U from waters flowing through phosphorite beds. The world reserves of phosphorites amount to many billions of tons, and it is therefore proposed that the extraction of U from these ores may be economical.

Metals and Metallurgy

12398 AECU-3762

Sciaky Bros., Inc. Research Div., Los Angeles.
SEAMWELDING DEVELOPMENT PROGRAM ON ZIRCONIUM CAN END CLOSURES. Final Report from June 1, 1956 to August 31, 1956. F. R. Koepenick—H. Goodley, ed. Sept. 1, 1956. 26p. For General Electric Co. Hanford Atomic Products Operation. Contract W-31-109-Eng-52. (GEH-23146). $4.80(ph OTS); $2.70(mf OTS).

A satisfactory welding schedule for zirconium can assemblies was demonstrated. (T.R.H.)

12399 AECU-3770

Illinois. Univ., Urbana.
DIFFUSION IN METALS. Progress Report and Publication List. Frederick Seitz and David Lazarus. May 15, 1958. 33p. Project No. 3. Contract AT(11-1)-67. $6.30(ph OTS); $3.00(mf OTS).

Information concerning diffusion is presented, including a study of the relative rates of diffusion of Fe^{55} and Fe^{59} in Ag, diffusion of Ru in Ag, self-diffusion in AgCd and AgIn, chemical and tracer diffusion in Ag—alpha AgCd diffusion couples, the influence of pressure on diffusion in AgZn alloys, the energy of motion of vacancies in Au at high pressure, and ionic conductivity of alkali halides as a function of pressure and temperature. A list of publications containing diffusion information is also included. (J.R.D.)

12400 AERE-M/R-2510

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
EFFECTS OF HEAT AND PRESSURE ON THE SWELLING OF IRRADIATED URANIUM. A. T. Churchman, R. S. Barnes, and A. H. Cottrell. Mar. 1958. 16p.

Small pieces of a natural uranium fuel bar, after irradiation at below 300°C, were heated to higher temperatures under various pressures. This heat-treatment produced changes in both density and microstructure. Heating in vacuum produced an increase in volume (i.e., swelling) of about 2% at 575°C, 4% at 810°C, and over 20% above 1000°C. Repeated thermal cycling, and reheating at low pressure after first heating at high pressure, produced swellings of 10 to 20% at 810 to 835°C. Examination of the swollen metal with optical and electron microscopes revealed bubbles (between 10^{-2} and 5×10^{-6} cm in diameter), and cracks; the latter were often associated with non-metallic inclusions and were particularly prevalent in thermally cycled specimens. The conclusion is drawn that the swelling is caused by the separation of the fission gases, krypton and xenon, to form gas pockets in the metal, and the mechanism of swelling is discussed. (auth)

12401 AFOSR-TR-58-48

California. Univ., Los Angeles. Dept. of Engineering.
PLASTIC DEFORMATION OF SURFACE AGGREGATES IN F.C.C. METALS. D. Rosenthal, N. E. Friedmann, W. B. Grupen, and R. Asimow. Feb. 1958. 74p. Contract AF18(600)-1022. (AD-154198).

Deviations from proportionality in the lattice strain-stress diagrams obtained from x-ray-diffraction study of plastically deformed polycrystalline aggregates cannot be reconciled with Taylor's homogeneous five slip mechanism of plastic flow. To account for the observed discrepancies a heterogeneous slip mechanism is postulated. The relevant theory is described and a lower bound is derived for the expression of the applied stress causing yielding of a particular crystalline aggregate in uniaxial loading. Good qualitative agreement is obtained when these expressions are compared with the results of an x-ray diffraction study of polycrystalline aluminum alloy. Within the scope of this study it is concluded that the proposed theory is particularly suited to the analysis of plastic behavior of surface grain aggregates at the initial stages of plastic deformation. A novel technique enabling the study to be extended to large plastic deformations is described. (auth)

12402 BMI-514

Battelle Memorial Inst., Columbus, Ohio.

ZIRCONIUM RESEARCH AND DEVELOPMENT. Progress Report No. 9 for September 15, 1950 to October 15, 1950. H. H. Bulkowski, J. J. Sebenick, I. E. Campbell, and B. W. Gonser. Oct. 15, 1950. 7p. Contract AT(30-1)-771. $1.80(ph OTS); $1.80(mf OTS).

A zirconium crystal bar, weighing 29 pounds and $1\frac{5}{16}$ inches in diameter by 8 feet in over-all length, was prepared, using pear-shaped zirconium couples to join the filament to the electrodes. This crystal bar was the largest produced to date in the 16-in.-diam. de Boer unit. The design of the couplings was modified to incorporate improvements indicated by the initial run, and another run is in progress. Binary alloys of Zr and Ni, Cr, and Si, as well as a zirconium alloy containing Fe, Al, and Si, were prepared for use as feed material in the small pyrex de Boer bulbs. The transfer of these elements from the feed to the crystal bar is being investigated. The rate of deposition and the type of crystal structure obtained with additions of various amounts of iodine are being studied. (auth)

12403 BMI-532

Battelle Memorial Inst., Columbus, Ohio.

ZIRCONIUM PILOT PLANT RESEARCH AND DEVELOPMENT. Progress Report. C. E. Dryden, O. E. Accountius, D. G. Black, B. C. Finney, B. A. Gruber, W. G. Jurevic, R. McDonough, L. F. Plock, R. F. Rolsten, D. A. Rosenbaum, H. F. Ross, and I. E. Campbell. Nov. 20, 1951. Decl. Dec. 28, 1956. 25p. Contract AT(30-1)-771B. $4.80(ph OTS); $2.70(mf OTS).

A summary of the work which was done on the small pilot plant during the week's operation shows the following: (1) High vaporization rates can be obtained from a vibrating flash plate. (2) Feeding powder to the plate at a constant and controllable rate presented some difficulty. This may be overcome by pumping between Victoprene seals, proper outgassing of the powder, using a smaller diameter screw, and sloping the feed screw upward to avoid translation of the powder by vibration. (3) Deposition rates could not be properly studied because of high noncondensable pressures. There is an indication that too high a flow rate favors the deposition of ZrI_2 if the filament temperature is too low. (4) No corrosion of the flash plate was evidenced during the short period the plant was in operation. A thorough study of corrosion must be made, however, since the entire process may depend on the durability of the flash plate. (5) This type of equipment offers a means of rapidly obtaining good data at a low cost on the fundamentals of an iodide-flow process for the production of zirconium metal. (auth)

12404 BMI-1272

Battelle Memorial Inst., Columbus, Ohio.

THE URANIUM–NITROGEN–CARBON SYSTEM. Alfred E. Austin and Arnold F. Gerds. June 23, 1958. 20p. Contract W-7405-eng-92. $0.75(OTS).

The ternary system uranium–nitrogen–carbon has been studied at 1800°C under vacuum and under a 1-atm. nitrogen pressure. There is complete solid solubility between UN and UC, and essentially no solid solubility of nitrogen in UC_2 or U_2C_3 or of carbon in U_2N_3. At 1800°C the two-phase field, U(C,N) and UC_2, and the three-phase field, U(C,N), UC_2, and C, exist in vacuum or argon. At 1 atm. of nitrogen, the uranium nitrides are more stable than the uranium carbides up to 1800°C, but at 2000°C, the uranium carbides UC_2 + U(C,N) become more stable. At 1 atm. of nitrogen, U_2N_3 is the stable phase up to 1550°C, and U(N,C) solid solution is stable at 1800°C. (auth)

12405 HW-53621

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

SOME EFFECTS OF COLD ROLLING, ANNEALING AND AGING ON THE MECHANICAL PROPERTIES OF ZIRCALOY-3b. D. E. Johnson. Nov. 15, 1957. 57p. Contract W-31-109-Eng-52. $1.50(OTS).

A study was made to determine the tensile properties of Zircaloy-3b as a function of the cold-worked condition of the material between the limits of 0 per cent cold work and 80 per cent cold work. The tensile properties were also determined for test temperatures of −50°C, 22°C, 100°C, 200°C, and 300°C. The investigations included a study to determine the effect of short time and long time annealing on the tensile test properties, and of alpha phase annealing treatments on the microstructure and mechanical properties of a simulated Zircaloy-3b weld structure. A preliminary study of aging effects was also made. (auth)

12406 KAPL-A-ME-1

Knolls Atomic Power Lab., Schenectady, N. Y.

MATERIALS MANUAL. W. D. Valovage and E. E. Baldwin, eds. Jan. 1, 1954. Changed from OFFICIAL USE ONLY June 11, 1958. 226p. Contract W-31-109-Eng-52. $34.80(ph OTS); $9.90(mf OTS).

The properties of 15 metals and alloys are summarized with bibliographic references. General characteristics such as composition, availability, nuclear properties, and applications are given along with data on fabrication, corrosion resistance, physical properties, and mechanical properties. The metals and alloys treated are: stainless steel types 347, 347(M1), and 304, Mo, Inconel-X, Be, Carboloy 779, Kennametal 138A, Na, Hf, Zr, Zircaloy-II, Cupro Nickel, $2\frac{1}{4}$ Cr–1 Mo, and ASTM A-302 steel. (T.R.H.)

12407 MAB-129-M

National Research Council. Materials Advisory Board.

REPORT OF THE PANEL ON BERYLLIUM. PART I. RAW MATERIALS GROUP. PART II. PHYSICAL METALLURGY GROUP. June 25, 1958. 101p. Contract DA-36-039-sc-76436.

The sources of Be, mining and beneficiating the ores, production, consumption and price history of beryl, development of new sources, and economic and political factors affecting the United States Be supply are surveyed. (J.E.D.)

12408 NP-6819

Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.

FORMABILITY OF TITANIUM AND TITANIUM ALLOYS. C. T. Olofson. June 30, 1958. 10p.

The general forming behavior, work-hardening capacity, formability ratings, and factors adversely affecting formability are outlined and evaluated for titanium and titanium alloys. The formability is compared to that of other metals. (L.T.W.)

12409 ORNL-2524

Oak Ridge National Lab., Tenn.

THE INFLUENCE OF COMPOSITION UPON THE 1500°F CREEP-RUPTURE STRENGTH AND MICROSTRUCTURE OF MOLYBDENUM–CHROMIUM–IRON–NICKEL BASE ALLOYS. Thomas Kirby Roche. July 9, 1958. 114p. Contract W-7405-eng-26. $2.75(OTS).

The objective of this investigation was to determine the influence of composition variation upon the 1500°F creep-rupture strength and microstructure of molybdenum–chromium–iron–nickel base alloys. The alloys for this study were encompassed by the range 10/20 Mo–5/10 Cr–4/10 Fe–0.5 Al–0.5 Mn–0.06 C–balance Ni. The composition of the individual alloys was varied systematically with the intent that by direct comparison the effect of an element upon strength could be determined. (auth)

12410 TID-7521(Pt. 1(Del.))

Division of Production, AEC.

PAPERS FOR THORIUM–URANIUM-233 INFORMATION MEETING HELD AT WILMINGTON, AUGUST 3, 1955. Dec. 1956. Decl. with deletions Mar. 14, 1957. 99p. $15.30(ph OTS); $5.40(mf OTS).

Separate abstracts have been prepared on three papers presented at this meeting: Direct Reduction of Thorium Oxide; The Preparation of Thorium Metal Powder by Fused Salt; and Cold Compacting and Arc Melting of Thorium Powder. (W.L.H.)

12411 TID-7521(Pt. 1(Del.)(p.3-12))

[Sylvania Electric Products Inc., Bayside, N. Y.]

DIRECT REDUCTION OF THORIUM OXIDE. R. B. Holden and N. Fuhrman. p.3-11 [of] PAPERS FOR THORIUM–URANIUM-233 INFORMATION MEETING HELD AT WILMINGTON, AUGUST 3, 1955. 10p.

A brief review of the status of the production of thorium powder from thorium oxide by calcium reduction is presented. The process is now conducted routinely on a scale which produces seven to eight pounds of powder per reduction. (W.L.H.)

12412 TID-7521(Pt. 1(Del.)(p.13-55))

Horizons, Inc., Cleveland.

THE PREPARATION OF THORIUM METAL POWDER BY FUSED SALT ELECTROCHEMICAL TECHNIQUES. James L. Wyatt. p.13-55 [of] PAPERS FOR THORIUM–URANIUM-233 INFORMATION MEETING HELD AT WILMINGTON, AUGUST 3, 1955. 43p.

Excerpt from SRO-17 (HZ-34).

A review of the program for the preparation of thorium metal powder by fused salt electrolysis is presented. The process which showed greatest promise was a fused salt all-chloride salt bath. The various electrolytic cells used are described. (W.L.H.)

12413 TID-7521(Pt. 1(Del.)(p.56-99))

Sylvania Electric Products, Inc. Atomic Energy Div., Bayside, N. Y.

COLD COMPACTING AND ARC MELTING OF THORIUM POWDER. Samuel Storchheim. p.56-99 [of] PAPERS FOR THORIUM–URANIUM-233 INFORMATION MEETING HELD AT WILMINGTON, AUGUST 3, 1955. 44p.

In the course of making pure Th by the technique of reducing the oxide with calcium it became necessary to find a method for consolidating the resultant powder. Because of the high reactivity of molten Th to all known crucible materials, it was decided to consumably arc melt the oxide reduced Th. The object for arc melting Th is to produce a dense, clean, and soft ingot which can be readily extruded into rods for subsequent use as Th fuel elements. (auth)

12414 WADC-TR-54-270(Pt. 3)

Cornell Aeronautical Lab., Inc., Buffalo.

INVESTIGATION OF THE COMPRESSIVE, BEARING, AND SHEAR CREEP-RUPTURE PROPERTIES OF AIRCRAFT STRUCTURAL METALS AND JOINTS AT ELEVATED TEMPERATURES. [Period covered] January–December 1955. Luke A. Yerkovich. Aug. 1956. 123p. Project title: MATERIALS ANALYSIS AND EVALUATION TECHNIQUES. Task title: DESIGN DATA FOR METALS. Contract AF33(616)-190. (AD-151194).

Various aircraft structural alloys have been exposed to a tension, compression, bearing, and shear creep test program to establish their high-temperature creep and rupture properties under the influence of these types of stresses. From results obtained in this investigation, it has been found that the test alloys display creep characteristics under compression, bearing, and shear stresses quite similar to those obtained in tension creep testing. The high-temperature creep and rupture behaviors of the test alloys have been presented in various tabular and chart forms and correlations of compression, bearing, and shear creep vs. tension creep on a stress basis have been made to assist in the assignment of creep stress values to members undergoing creep strain other than tension. (auth)

12415 WAPD-TM-81

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

THE STRENGTHENING EFFECT OF BERYLLIUM ON ZIRCALOY-3. Interim Report. R. E. Johnson and A. F. Steeves. Aug. 16, 1957. 29p. Contract AT-11-1-GEN-14. $1.00(OTS).

In order to increase the strength of Zircaloy-3 by alloying, four Zircaloy-3 ingots containing 0.05, 0.15, 0.35, and 0.70 wt. % Be, respectively, were cast and fabricated. A heat-treatment study of the as-cast material indicated that the proper range of hot-working temperatures had an upper limit of 900°C, above which incipient liquation occurred. All four ingots were successfully extruded to ¾-in.-diam. bars from 3-in.-diam. ingots at 850°C. The lower limit of extrusion temperature seemed to be near 800°C, as evidenced by excessive cracking at lower temperatures. The as-extruded bars had tensile strengths up to 150% of the unmodified Zircaloy-3 value, with the actual strength of each tensile specimen a function of its beryllium content. Further hot working after extrusion apparently increases both the yield strength and tensile ductility over the as-extruded condition. Hot tensile data indicate a sizeable increase in strength over both Zircaloy-2 and Zircaloy-3 with the addition of about 0.35 wt. % Be. On the basis of initial data, it can be concluded that the material, with the exception of Zircaloy-3 with 0.70 wt. % Be, has corrosion resistance in 680°F water equal to that of Zircaloy-2. (auth)

12416 WAPD-TM-132

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

INTERIM REPORT ON CREEP BEHAVIOR OF ZIRCALOY-2 AND -3. W. D. McMullen. Apr. 1958. 24p. Contract AT-11-1-GEN-14. $0.75(OTS).

A study of creep properties of atmosphere-melted

Zircaloy-2 and Zircaloy-3 was made. Four different material conditions were studied from 200 to 400°C. Zircaloy-2 was found to have much better creep properties than Zircaloy-3 even though their tensile properties are quite similar. The difference was magnified at lower second stage creep rates and/or higher temperatures. Creep of zirconium and the Zircaloys tends to follow theoretical high-temperature creep behavior in agreement with the temperature dependence of other mechanical properties of zirconium. A high degree of preferred orientation resulted from the swaging treatment. This was shown by elliptical fracture surfaces and multiplicity of reduced sections in the base annealed material. Several minimum creep rate vs. load and design curves are given. (auth)

12417 WAPD-ZH-8

Westinghouse Electric Corp. Bettis Plant, Pittsburgh. ZIRCONIUM HIGHLIGHTS. June 1958. 23p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

The relationship of cooling rate to the corrosion resistance and the effect of heat treatment on the tensile and corrosion properties of Zircaloy-2 are reported. A study of consumable-electrode melting conditions, the effect of H_2 on the alpha-plus-beta phase limits of Zircaloy-2, the flare and flatten testing of Zircaloy tubing, and duplex corrosion tests are presented. (J.E.D.)

12418 AEC-tr-3221

THE MECHANICAL PROPERTIES OF CAST RHENIUM. E. M. Savitskii and M. A. Tylkine. Translated for Los Alamos Scientific Lab. from Trudy Inst. Met. (im. A. A. Baikova), Pt. 1, 158-61(1957). 5p.

As a result of the work performed it is definitely shown that cast rhenium can be obtained. Numerical values were obtained for its hardness at different temperatures in the interval from −194° to + 1150°, and for its plasticity at 20 and 1000° by the method of compression. It was found that rhenium possessed a high riveting ability. The temperature at which the recrystallization of rhenium begins is about 1500°. (auth)

12419 AEC-tr-3297

USE OF TRITIUM FOR A RADIOGRAPHIC INVESTIGATION OF THE DISTRIBUTION OF HYDROGEN IN TITANIUM AND ZIRCONIUM. B. I. Bruk and G. I. Nikolsev. Translated by the Oak Ridge National Lab. Library Staff from Doklady Akad. Nauk S.S.S.R. 116, 78-80 (1957). 6p.

The use of tritium in radiographing Zr and Ti for H_2 distribution was accomplished by saturating the metals with a mixture of tritium and hydrogen to 700 to 1000 ml gas per 100 g metal. The T_2 was obtained by decomposing tritium water vapors at the surface of the zinc jet in a vacuum. Radiographing was done with nuclear NIKFI film, MP-type, over a period of 20 to 30 days. The method was used to reveal several facts about hydride distribution in melts and during welding. (T.R.H.)

12420 AERE-Lib/Trans-783

THE STUDY OF DIFFUSION OF CARBON IN NICKEL AND ITS ALLOYS USING THE RADIOACTIVE ISOTOPE C^{14}. P. L. Gruzin, Yu. A. Polikarpov, and G. B. Fedorov. Translated by J. Adam (U.K.A.E.A., Atomic Energy Research Establishment) from Fiz. Metal. i Metalloved. Akad. Nauk S.S.S.R., Ural. Filial 4, 94-102 (1957). 11p.

Application of radioactive isotopes can bring valuable information concerning the mobility of atoms in solids in diffusion processes. The use of radioactive C^{14} is particularly valuable in the study of diffusion of carbon in iron, nickel, steel, and other metals and alloys. This paper contains results of investigations of the diffusion of carbon in nickel and in certain nickel alloys and a short description of the method of determination of the diffusion constant of carbon. (auth)

12421

FRAGILITY OF TANTALUM IN THE PRESENCE OF HYDROGEN AT AMBIENT TEMPERATURES. Auguste Clauss and Hubert Forestier. Compt. rend. 246, 3241-3(1958) June 9. (In French)

Experiments with Ta wires from two sources are described. It was found that hydrogen embrittlement manifested itself only during deformation. The decrease in resistance to drawing varied with the rate of application of force. Study of the modulus of torsion showed that hydrogen does not affect the area of elastic deformation. (T.R.H.)

12422

THERMOMAGNETIC STUDY OF THE ALLOTROPIC VARIETIES OF PLUTONIUM. Maurice Seguin, Marie-Madeleine Folmer, Jacques Friedel and Emmanuel Grison. Compt. rend. 246, 3243-6(1958) June 9. (In French)

The magnetic susceptibility of Pu was measured in temperature ranges sufficiently wide for each phase, in combination with measurements during heating and cooling. No magnetic anomaly was observed. None of the allotropic varieties seemed to present a paramagnetism of the Curie-Weiss type. (auth)

12423

THE LAMELLAR STRUCTURE OF THE EUTECTIC Al/Cu IN A THIN FILM OBSERVED WITH AN ELECTRON MICROSCOPE. Noboru Takahashi and Kan-ichi Ashinuma. Compt. rend. 246, 3430-3(1958) June 23. (In French)

A well-defined lamellar structure was found in the eutectic 33 wt.% Cu−Al by direct observation with the electron microscope by transmission. The transformation due to heating was also observed. (auth)

12424

COLD WORKING AND RESTORATION DURING HOT DEFORMATION: THE CASE OF ZIRCONIUM. Jacques Boghen, Donald Whitwham, and Jean Herenguel. Compt. rend. 246, 3344-7(1958) June 16. (In French)

The experiments were performed on Knoll Zr containing Hf. The Zr plates of 12, 6, 3, and 1.5 mm thickness had been salt-bath annealed for 30-min at 800°C. Three series were rolled to 1 mm final thickness at 20, 200, and 350°C to bring about deformations of 50, 200, 500, and 1100% at each temperature. The hot-rolled specimens were reheated in a neutral liquid between each pass. For the 1100% deformation the total time spent at 200 or 350°C was about 1½ hours. At the latter temperature the restoration of the metal deformed 150% at 20°C is still very low for this length of time. It must be pointed out that if one could obtain samples deformed 500 or even 1100% at 20°C, it is not possible to roll in this condition without extensive tearing at the edges. The mechanical properties of all the samples were measured. From these studies it was concluded that deformation of Zr above 20°C and below the recrystallization temperature allows the production of several useful forms. (T.R.H.)

12425

EFFECTS OF THE DURATION OF THE LOAD AND THE MAINTENANCE OF AMBIENT TEMPERATURE ON HYDROGEN EMBRITTLEMENT IN STEEL. Jacques

Plusquellec, Pierre Azou, and Paul Bastien. Compt. rend. 246, 3454-7(1958) June 23. (In French)

The effects of the duration of loading and the duration of maintenance at ambient conditions on embrittlement of extra-mild steels by electrolytically introduced hydrogen were studied. The details of the loading are described. (auth)

12426

SOLVE LAMELLAR PHASE PROBLEM IN A-286. Kenneth Metcalfe (Universal-Cyclops Steel Corp., Bridgeville, Penna.). Iron Age 182, No. 1, 72-4(1958) July 3.

The formation of a pearlite-like lamellar phase in the grain boundaries of austenitic stainless steel Z-286 lowers its stress-rupture life. This difficulty may be overcome by keeping boron content over 0.001% in parts not processed by cold working. Where severe cold working between solution treating and aging is necessary, lamellar phase can be eliminated by re-solution treating at 2,000°F. (T.R.H.)

12427

THE THERMODYNAMIC PROPERTIES OF THE SILVER–CADMIUM SYSTEM. Philip D. Anderson (Univ. of California, Berkeley). J. Am. Chem. Soc. 80, 3171-5(1958) July 5.

The heats of formation of the ζ, β' and γ-phases of the Ag–Cd system have been measured by means of liquid tin solution calorimetry. These results, together with a critical evaluation of the literature, have made possible a confident thermodynamic description of the Ag–Cd system as a whole. The estimation of heats of formation from activity data (without using temperature coefficients) and the phase diagram has been described. The results are in good agreement with the experimental values, except for the γ-phase, for which an order–disorder transformation is believed to occur. (auth)

12428

HEAT CAPACITIES, ENTROPIES AND ENTHALPIES OF TANTALUM BETWEEN 12 AND 550°K. K. F. Sterrett and W. E. Wallace (Univ. of Pittsburgh). J. Am. Chem. Soc. 80, 3176-7(1958) July 5.

Heat capacities of tantalum have been measured between 12 and 550°K with a precision of 0.15% or better. The Third Law Entropy at 25° is found to be 9.92 ± 0.01 e.u./g atom, in good agreement with earlier work. Differences ranging up to 3% were observed between present heat capacity results and those previously published for temperatures above 325°K. Agreement between low temperature heat capacities reported here and elsewhere is somewhat better. (auth)

12429

SURFACE STRUCTURE OF SLIP BANDS ON COPPER FATIGUED AT 293°, 90°, 20°, AND 4.2°K. D. Hull (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Inst. Metals 86, 425-30(1958) May.

The slip bands produced during the fatigue deformation of high-purity copper at temperatures between 293° and 4.2°K. have been studied with the optical and electron microscopes. Replicas of the surface reveal the changes in contour within individual slip bands, above and below the surface. Extrusions and intrusions are formed in the slip bands at all the temperatures of testing, and their formation is not suppressed at 4.2°K. Intrusions have been detected in specimens fatigued for less than 1% of the estimated lifetime, and it is believed that they constitute the first fatigue cracks. The observations are discussed in terms of recent theories of extrusion and intrusion. (auth)

12430

NOTE ON A REDETERMINATION OF THE ALUMINIUM–GALLIUM EQUILIBRIUM DIAGRAM. J. W. H. Clare (Aluminium Labs. Ltd., Banbury, Eng.). J. Inst. Metals 86, 431-2(1958) May.

Thermal analysis was used to establish the form of the aluminum–gallium equilibrium diagram. The system was found to consist of a simple eutectic with a eutectic temperature of 26.6° C; the eutectic composition was not established. Metallographic and x-ray examination confirmed the existence of only two phases—aluminum and gallium. A tentative solidus was established down to 300° C by a metallographic examination of annealed and quenched alloys. (auth)

12431

ELECTRO-DEPOSITION OF NICKEL ALLOYS FROM THE PYROPHOSPHATE BATH: NICKEL–ZINC AND NICKEL–MOLYBDENUM ALLOYS. S. K. Panikkar and T. L. Rama Char (Indian Inst. of Science, Bangalore). J. Sci. Ind. Research (India) 17A, 95-6(1958) Feb.

Results of studies on the electrodeposition of nickel–zinc and nickel–molybdenum alloys in a pyrophosphate bath using platinium electrodes are presented. The fects of varying current density and metal contents of the electrolyte on alloy deposit composition, cathode efficiency, and cathode potential are presented in tabular form. (J.R.D.)

12432

HEAT TREATING AFFECTS ALUMINUM EXTRUSIONS. J. K. McLaughlin (Magnethermic Corp., Youngstown, Ohio). Metal Progr. 74, No. 1, 105-7 (1958) July.

A study was made of the effect of homogenization on the mechanical properties of solution-treated and aged aluminum and the quantitative effects of several variables on hardness. The effect of alloying elements on the increase in hardness of aluminum is shown. (J.E.D.)

12433

A REVIEW OF DIFFUSION IN ALUMINIUM. J. W. H. Clare (Aluminium Labs., Ltd., Banbury, Oxon). Metallurgia 57, 273-8(1958) June.

The published data on diffusion in aluminum alloys were collected and presented so that direct comparison and easy assessment are possible. The most likely sources of error introduced during experimental work are discussed. (auth)

12434

THE STRUCTURE OF ELECTROLYTICALLY PRODUCED NICKEL FILMS FROM 20 TO 50 A THICK. H. Pfisterer, A. Politycki, and E. Fuchs (Siemens & Halske A. G., Karlsruhe, Ger.). Naturwissenschaften 45, 282-3(1958).

In the electron microscopic study of copper surfaces, a very thin nickel layer is electrolytically deposited on the copper. The copper is then dissolved in chromic and sulfuric acid, but the nickel film is not attacked at all because of the formation of a passive layer by the oxidizing acids. For an investigation of this oxide layer and the rest of the film, films 20 A thick were prepared. The orientation of the oxide lattice and the size of the oxide crystals were determined. It is shown that the intensity of the nickel interference is dependent on the total film thickness. (J.S.R.)

12435

MOLECULAR STRUCTURE AND VISCOSITY OF LIQUID METALS AND ALLOYS. A. Z. Golik. Nauk Zapiski Kiev. Inst. 14, No. 8, 159-69(1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 6396.)

12436

PRECIPITATE INSTABILITY DURING UNIDIRECTIONAL EXTENSION OF AN AGE HARDENED ALUMINIUM–ZINC–MAGNESIUM ALLOY. I. J. Polmear and I. F. Bainbridge (Australian Defence Scientific Service, Melbourne). Phil. Mag. (8) 3, 655-7(1958) June.

High-purity alloys of Al–2.65% Mg–5.5% Zn and Al–1% Cu–3% Mg–6% Zn were studied with the object to detect structural changes associated with slip planes. Slip bands were observed in polished and etched sections from the interior of both tensile and fatigue specimens. Metallographic changes associated with fatigue and tensile stressing of a series of Al–Mg–Zn alloys were also studied. (W.D.M.)

12437

EVIDENCE FOR DISLOCATION BREAKWAY IN PURE ALUMINUM. Rohn Truell and Raymond Bayer (Brown Univ., Providence). Phys. Rev. 110, 1206-7(1958) June 1.

Attention is called to the very rapid increase in acoustic attenuation at low strains, and it is pointed out that this effect has been observed only in the high-purity almost single-crystal sample. It is proposed that this rapid attenuation increase at very low strain is an example of dislocation "breakaway" and that the effect is caused by an increase in dislocation loop length arising when the dislocations free themselves from relatively weak pinning at low strains. (A.C.)

12438

ON THE STRUCTURE OF METAL–CERAMIC ALLOYS OF IRON–CARBON–COPPER. G. I. Aksenov and V. K. Sorokin (Gor'kiy Polytechnic Inst., USSR). Poroshkovaya Met. Yaroslavl' 79-82(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 9346.)

It is shown that the change in the thermal conditions of carbonization sintering makes it possible to obtain austenite with varying concentrations of carbon. In carbonization sintering of pressed specimens made of an iron–copper charge there occurs, predominantly, diffusion of carbon along the boundaries of the metal grains. Addition of copper to the charge prevents the diffusion of carbon from the boundaries inside the grain of the metal.

12439

THE TANTALUM–COLUMBIUM ALLOY SYSTEM. D. E. Williams and W. H. Pechin (Iowa State Coll., Ames). Trans. Am. Soc. Metals 50, 1081-9(1958).

The tantalum-niobium alloy system was investigated by means of x-ray, electrical resistance and metallographic methods. The constitution diagram is an unbroken series of solid solutions. No evidence of a solid transformation was found in any of the alloys. The solidus line rises smoothly from the melting point of niobium, 2420°C (4388°F), to the melting point obtained for tantalum, 2940°C (5324°F), and the liquidus was found to follow quite closely the path taken by the solidus. Experimental results are given and equipment is described. (auth)

12440

THE HEATS OF FORMATION IN THE SYSTEM ALUMINIUM + NICKEL + TITANIUM. O. Kubaschewski (National Physical Lab.). Trans. Faraday Soc. 54, 814-20(1958) June.

The heats of formation of 49 ternary and 27 binary alloys in the nickel + titanium + aluminum system from the component metals have been determined directly by means of a calorimeter described previously. From the results the isoenthalpy diagram has been drawn, and some information on the phase diagram has also been obtained from the heat-of-formation curves as well as from x-ray analysis. (auth)

12441

SUPERCONDUCTIVITY OF BORIDES, CARBIDES, NITRIDES, AND SILICIDES OF TRANSITION METALS. G. V. Samsonov and V. S. Neshpor (Moscow Inst. of Nonferrous Metals and Gold). Zhur. Eksptl. i Teoret. Fiz. 30, No. 6, 1143(1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 1143.)

From an analysis of the behavior of the transition points T_k in the superconducting state of compounds of the following series TiC and TiN; VC and VN; and ZrB, ZrC, and ZrN, the author assumes that the value of T_k is related to the distribution of the electron density, i.e., it depends on the accepting ability 1/(Nn) of the atom of the transition metal and on the ionization potential φ of the metalloid. The most favorable ratio of the values 1/(Nn) and φ is found apparently in the Nb and Ta compounds. The sharp reduction in the number 1/(Nn) for Ti, Zr, V, and Hf compared with Ta, Nb, W, and Mo is accompanied by a sharp increase in the values of T_k. In many cases the value of T_k increases with increasing content of metalloid in the phases, for example; Nb_2N — 9.5°K, NbN — 15°K; Mo_2C — 2.9°K, MoC — 8°K. The relatively low values of T_k for borides compared with carbides and nitrides are due apparently to the small fraction of electrons capable of making up the electron deficiencies of the atoms of the transition metals. Silicon compounds, which have still a lower ionization potential, should occupy a place in the MeSi — MeB — MeC — MeN series, which is indeed confirmed in most cases.

12442

MELTING AND FABRICATION OF A SILVER BASE ALLOY FOR CONTROL USE IN NUCLEAR REACTORS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 62, Session 18. R. J. Haffeman, W. B. Haynes, and R. W. Tombaugh (Westinghouse Electric Corp., Pittsburgh). New York, American Institute of Chemical Engineers, 1958. 23p.

Melting techniques used to produce sound, homogeneous ingots are presented. Techniques used in fabrication are discussed, and special methods used for the extrusion and measurement of special cruciform shapes over six feet in length are described. Illustrations of microstructure, ingot macrostructure, and of various fabrication stages are also presented. (auth)

Tracer Applications

Refer to abstract 12419.

PHYSICS

12443 ARC-CP-291

Gt. Brit. Aeronautical Research Council.

THE USE OF MULTIPLE DIAPHRAGMS IN SHOCK TUBES. B. D. Henshall. Dec. 3, 1955. 44p. (ARC-18062). $1.08(BIS).

Calculations are presented which illustrate the advantages of various types of multiple-diaphragm shock tubes over the single-diaphragm conventional shock

tube. Shock tubes having a discontinuous change of cross section at a diaphragm station or at any other position along the tube are also considered. (auth)

12444 CF-58-5-116
Oak Ridge National Lab., Tenn.
RELATION BETWEEN HINDERED SETTLING RATE AND VISCOSITY OF THORIA SLURRIES. J. M. DellaValle and C. F. Bishop. May 1, 1958. 11p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The hindered settling rate, u_o, of an aqueous thorium oxide suspension (≤ 700 g Th/kg H_2O) is related to Stokes' settling rate, u_s, by the equation $u_s/u_o = 9.4\ (1-\epsilon)/\epsilon^3$, where ϵ is the void fraction and $(1-\epsilon)$ the volume fraction of solids. A similar expression should hold between the viscosity of the water and the slurry viscosity. Viscosity measurements from room temperature to 100°C on 200 to 700 g Th/kg H_2O slurries of thorium oxide calcined from 1000 to 1600°C indicate that such a relationship does apply. (auth)

12445 HW-51856
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
REACTOR PHYSICS PRIMER. E. H. Lockwood. Nov. 15, 1957. 113p. Contract W-31-109-Eng-52. $3.00 (OTS).

An introduction for the beginner to the fundamentals of nuclear physics is presented, dealing generally with the reactor physics aspects of the processes used at Hanford in the production of plutonium. The information is presented primarily for reactor operators and is intended as an aid toward better understanding of crucial pile conditions, as a training guide for new personnel, and as a source of subject matter for group discussion. (J.R.D.)

12446 IGR-TN/C-888
United Kingdom Atomic Energy Authority. Industrial Group H.Q., Risley, Lancs, England.
DETERMINATION OF THE SURFACE AREA OF CALCIUM FLUORIDE BY GAS ADSORPTION. J. Brown. 1958. 10p.

Two sets of apparatus for the determination of surface areas of calcium fluoride are described. The volumetric apparatus was found to be preferable for adsorptions involving permanent and semi-permanent gases. The main advantages of the gravimetric method lay in measuring adsorption of vapors for which pressure-volume relationships are more difficult to determine. (J.E.D.)

12447 NP-6806
Stanford Research Inst. Poulter Labs., Menlo Park, Calif.
STUDY OF SHOCK PROPAGATION IN FERROUS METALS. Technical Report 010-55. Samuel Katz and Rudolph E. Peterson. Dec. 20, 1955. 46p. Contract DA-04-200-ORD-257.

The results of a further study of collision zones and associated effects in annealed and rolled low- and medium-carbon steel, Armco iron, and stainless steel are described. (A.C.)

12448 NP-6808
Illinois. Univ., Urbana.
IONIC CONDUCTIVITY AND DIFFUSION IN CESIUM BROMIDE AND CESIUM IODIDE. Technical Report No. 1 [on] PHYSICS OF THE SOLID STATE. David W. Lynch. June 1958. 71p. Contract NONR-1834-(19).

Ionic transport properties of CsBr and CsI were investigated by means of electrical conductivity measurements and tracer diffusion coefficient measurements on single crystals. Above the highest temperature listed for each salt the conductivities have no simple expressions. The conductivities listed are characteristic of the purest crystals available. At temperatures below that at which the impurity-controlled conductivity is predominant, which varies from sample to sample, the conductivity curves had slopes corresponding to enthalpies from 0.51 ev to 0.59 ev for both salts. Conductivity measurements on CsBr doped with Cs_2S and with $BaBr_2$ indicate that these impurities are so insoluble in the lattice that experiments on doped crystals may prove difficult to perform. It is concluded that ionic transport is responsible for nearly all of the observed conductivity of both CsBr and CsI, but the mechanisms by which the ions move cannot be determined from these experiments. Simple vacancy motion in each sub-lattice cannot alone account for the observations, and several additional mechanisms are discussed. The halogen ions seem to move by at least two mechanisms. Unlike the alkali halides of the NaCl structure, the predominant mobile defects in CsBr and CsI are the anionic defects, but cationic mobility is by no means negligible. (auth)

12449 NP-6816
Massachusetts Inst. of Tech., Cambridge. Lab. for Insulation Research.
TABLES OF DIELECTRIC MATERIALS. VOLUME VI. Technical Report 126. W. B. Westphal. June 1958. 114p. Contract Nonr-1841(10).

In accordance with the previously announced aim of terminating this series of "Tables of Dielectric Materials", Volume VI is presented as the final one. It is supplementary to volumes IV and V and includes new materials and extended data on some of the materials listed in previous tables. (A.C.)

12450 NYO-7930
Aeroprojects, Inc., West Chester, Penna.
APPLICATIONS OF ULTRASONIC ENERGY. Progress Report No. 9 Covering Period from April 1, 1958 to May 31, 1958. June 1958. 63p. Contract AT(30-1)-1836. $10.80(ph OTS); $3.90(mf OTS).

Studies in aqueous precipitation of thorium oxalate under ultrasonic influence were continued. The smallest and most uniform oxalate particles, many of which were in the submicron region, were produced by fast addition of solid oxalic acid to thorium nitrate solution at a temperature of about 20°C followed immediately by 5 min. of ultrasonic treatment, or by fast addition of oxalic acid solution to thorium nitrate solution at 20°C followed by 30 min. of ultrasonic agitation. The shorter treatment time favors the former method. Ultrasonic leaching of a simulated cesium-bearing alumina waste with 0.01 N nitric acid solution was most effectively accomplished in a "fixed-bed" treatment vessel. Extrapolation of experimental data suggested that close to 100% of the radioactive material could be removed from 5 grams of waste in 24 hours by uninterrupted batch-type ultrasonic treatment, using 300 milliliters of nitric acid solution, or in 10 to 12 hours by continuous-flow treatment using 9 to 10 liters of leaching liquid. With the view of applying vibratory energy to accelerate magnesium extraction of plutonium from uranium, preliminary experiments indicated tantalum to be a potentially satisfactory container material for the molten metal system; the tantalum resisted attack, under ultrasonic influence, by molten uranium–chromium alloy at temperature up to 950°C. Design and construction of a treatment array incorporating a

tantalum vessel were initiated. Agglomeration of a dilute aerosol of solid submicron KCl particles (simulating a highly radioactive aerosol waste stream) in an ultrasonic standing-wave field, using an additive liquid aerosol to promote coalescence, indicated that close to 100% of the aerosol could be trapped by this method, although optimum conditions have not yet been established. Ultrasonic agglomeration in liquid systems using an annular standing-wave treatment vessel appeared promising. (auth)

12451 SCR-23

Sandia Corp., Albuquerque, N. Mex.

DIGITAL DATA GATHERING SYSTEM, BLOWDOWN WIND TUNNEL. W. T. Botner. Apr. 1, 1958. 4p. Contract AT-(29-1)-789. $1.80(ph OTS); $1.80(mf OTS).

Presented at the Ninth Meeting of the Supersonic Wind-Tunnel Assoc., Univ. of Southern Calif., and U. S. Naval Air Missile Test Center, Point Mugu, Calif., Apr. 1958.

The Sandia 12 × 12-inch, transonic, blowdown tunnel facility is being equipped with a 10-channel digital data-gathering system. The design and operation of the system are discussed. (W.L.H.)

12452 SCR-24

Sandia Corp., Albuquerque, N. Mex.

COMPARISON OF STAGNATION PRESSURE CONTROL SYSTEMS FOR A 12-INCH BLOWDOWN TRANSONIC TUNNEL. R. C. Maydew. [Oct. 1957]. [Issued] June 1958. 7p. Contract AT-(29-1)-789. $1.80(ph OTS); $1.80(mf OTS).

Presented at the Eight Meeting of the Supersonic Wind-Tunnel Association, Seattle, Wash., Oct. 1957.

The two control systems are compared for nominal stagnation pressures of 16 and 34 psia. The improved performance of system B has resulted in increased Mach number capability of the tunnel, improved Mach number control during a run, and an increase in the run frequency. (W.L.H.)

12453 SCTM-139-58(16)

Sandia Corp., Albuquerque, N. Mex.

COMPONENT ACOUSTIC TESTING PLANE WAVE TUBE AND REVERBERANT CHAMBER METHODS. Charles W. Remaley. July 8, 1958. 38p. Contract AT-(29-1)-789. $1.00(OTS).

The design features and operating parameters of plane wave tube and reverberant chambers are described. Four different size plane wave tubes are used with a driving power of 200 audio watts to achieve sound pressure levels up to 154 db between 300 and 7500 cps. Two reverberant chambers are described and their performance evaluated. A comparison is made of the merits of plane wave sound fields and reverberant sound fields for testing purposes. (auth)

12454 UCRL-5210

California. Univ., Livermore. Radiation Lab.

PRESSURE INDUCED METALLIC TRANSITIONS IN INSULATORS. B. J. Alder and R. H. Christian. Nov. 1957. 7p. Contract W-7405-eng-48. $0.50(OTS).

Experimental evidence that several ionic and molecular crystals become conductors in the metallic range at ~250,000 atm. is presented. For some the transition pressure is roughly defined. (T.R.H.)

12455 AEC-tr-3264

SURFACE TENSION OF SOLUTIONS OF ISOTOPES OF HELIUM. B. N. Eselson and N. G. Bereznyak. Translated by Lydia Venters (Argonne National Lab.) from Doklady Akad. Nauk S.S.S.R. 98, 569-71(1954). 6p.

The surface tension of He^4 and of solutions with 1.00, 2.40, and 4.23% He^3 was measured between 1.35°K and the λ point. The results show that the surface tension decreases when the He^3 concentration increases. The dependence of the surface tension of the solutions on the temperature is somewhat smaller than that of pure He^4, which probably is determined by the circumstance, that the surface energy which is contributed by the admixture remains unchanged as the temperature drops, while the contribution which is determined by rotons and phonons decreases. (auth)

12456 AEC-tr-3266

THERMODYNAMIC STUDIES AT LOW TEMPERATUES. II. MEASUREMENTS OF THE HEAT CAPACITY OF SOLID BODIES AND LIQUIDS BETWEEN 12 AND 300°K. I. G. Strelkov, E. S. Itskevitch, V. N. Kostrukov, G. G. Mirskaya, and B. N. Samoilov. Translated by Lydia Venters (Argonne National Lab.) from Zhur. Fiz. Khim. 28, 459-72(1954). 21p.

A vacuum calorimeter with screening shields was constructed which enables the heat capacity to be measured at low temperatures of substances which are solid or liquid at room temperature. The vacuum casing of the calorimeter is made demountable owing to the introduction of the separable vacuum seal which operates at low temperatures. The apparatus is equipped with all the required auxiliary devices. The measurement of the energy which is transmitted into the calorimeter is made by constructing a relay which connects the power to be measured for a whole number of impulses produced by the pendulum of a clock. A vacuum calorimeter was calibrated. With the aid of the apparatus described it is possible to make measurements in the range 12 to 300°K. (auth)

12457 AEC-tr-3295

ELECTRIC RESISTANCE AND MAGNETIC SUSCEPTIBILITY OF PALLADIUM WIRES CHARGED WITH DEUTERIUM. A. Sieverts and W. Danz. Translated for Westinghouse Bettis Atomic Power Div. from Z. physik. Chem. (Leipzig) 38B, 61-71(1937). 11p.

Deuterium increases the electrical resistance of palladium more strongly than does hydrogen. The relative increase of resistance of the alloy $PdD_{0.66}$ is 0.92, that of the alloy $PdH_{0.66}$ is only 0.58. The highest relative increase of resistance amounts to 0.92 for deuterium, 0.69 for hydrogen; the appropriate concentrations lie at $PdD_{0.66}$ and $PdH_{0.79}$. The resistance concentration curve of the Pd–D alloys proceeds convexly toward the axis of concentration, that of the Pd–H alloys, on the other hand, runs primarily rectilinearly. In the case of supersaturation of palladium under rising current densities, resistance in the case of deuterium and of hydrogen falls to a lower limiting value below the highest value. Equiatomic amounts of deuterium and hydrogen reduce the magnetic susceptibility of paramagnetic palladium in the same way. (auth)

12458

THEORETICAL SURFACE TENSION OF Ti, Zr, AND Hf. Dan McLachlan, Jr. (Stanford Research Inst., Menlo Park, Calif.). J. Appl. Phys. 29, 1134(1958) July.

The experimental values for the surface tension of titanium, zirconium, and hafnium were found to be in fair agreement with calculated values. (A.C.)

12459

CALCULATION OF REACTION PROFILES BEHIND STEADY-STATE SHOCK WAVES. I. APPLICATION TO DETONATION WAVES. Russell E. Duff (Los Alamos Scientific Lab., N. Mex.). J. Phys. Chem. 28, 1193-7(1958) June.

A numerical procedure for the integration of an arbitrary system of kinetic equations subject to the constraints imposed by steady state shock hydrodynamics is described. The detonation profile has been calculated for a $2H_2 + O_2 + Xe$ mixture at an initial pressure of 30 mm Hg. These conditions correspond to those used by Kistiakowsky and Kydd in a measurement of the wave profile. The calculated profile is in qualitative agreement with the measured one. The calculation provides empirical evidence that a frozen sound speed definition of the Chapman-Jouguet state cannot correspond to reality. (auth)

12460

INSTALLATION OF AN IRRADIATION FACILITY FOR 1 KILOCURIE OF RADIOCOBALT. Marc Lefort and Xavier Tarrago (Laboratorie de Physique Nucléaire de la Faculté des Sciences de Paris à Orsay). J. phys. radium 19, Suppl. No. 4, 61A-4A(1958) Apr. (In French)

Design of a kilocurie Co^{60} gamma-ray source is described. Irradiation facilities are given both for research on radiation chemistry and photonuclear reactions. Cobalt samples were placed in six small cylinders in a lead drum. Dose-rates are indicated for various exposure chambers. The volume of the central exposure chamber is of 1,000 cc and the integral dose rate is of 2×10^8 rads kg/hour. Tubes or electrical leads connected to external apparatus can easily be introduced with the sample. (auth)

12461

DO THE 'CONSTANTS OF NATURE' CHANGE WITH TIME? D. H. Wilkinson (Clarendon Lab., Oxford). Phil. Mag. (8) 3, 582-5(1958) June.

The age of minerals determined by radioactive methods agrees roughly with the age of the galaxy. This suggests that radioactive alpha-decay constants have probably changed by less than a factor of 3 or 4 during the last 3 or 4×10^9 years. It is shown that this implies that many 'Constants of Nature', particularly e, h, and c, probably change more slowly than 10^{-12} parts per year. The meson coupling constant also appears to change more slowly than this and the beta-coupling constants by less than 10^{-9} parts per year. (auth)

12462

NEUTRON DIFFRACTION INVESTIGATION OF THE 119°K TRANSITION IN MAGNETITE. Walter C. Hamilton (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 110, 1050-7(1958) June 1.

Neutron diffraction measurements on synthetic single crystals of magnetite confirm the orthorhombic ordering scheme proposed by Verwey and co-workers to explain the changes in physical properties which magnetite undergoes when cooled below 119°K. A magnetic field suitably applied during cooling prevents the multiple twinning which occurs in the absence of a field and allows one to make the following deductions: The spins of all magnetic ions align themselves parallel to the cubic [001] direction nearest the direction of the external field. The face diagonals of the cube orthogonal to this c axis become the orthorhombic a and b axes. If these are labeled such that a is magnetically harder than b, the ferric ions in octahedral sites lie in rows parallel to a and the ferrous ions in rows parallel to b. Although the average oxygen position is unchanged, there are presumably shifts in the four oxygen parameters which compensate for the effect of the ordering on the ionic sizes at the various sites. In attempting to reproduce the results on natural crystals, which had a transition temperature some five to ten degrees lower, it was found impossible to remove the [a,b] twinning by use of a magnetic field; furthermore, failure to observe an (002) reflection would seem to indicate that the twinning persists on a micro basis, that is, that there is only short-range order. A least-squares fit was made to the intensities of the cubic phase at 296°K; a value of $u = 0.2548 \pm 0.0002$ was obtained for the oxygen parameter in the spinel structure. The severe primary and secondary extinction encountered was satisfactorily accounted for by methods previously described by the author. (auth)

12463

STRUCTURE OF THALLIUM AND GADOLINIUM AT LOW TEMPERATURES. C. S. Barrett (Univ. of Chicago). Phys. Rev. 110, 1071-2(1958) June 1.

X-ray diffraction at temperatures from 300°K to 5°K has been employed to search for a low-temperature transformation in thallium that might account for the anomaly in the pressure coefficient of the superconducting transition temperature of this element. No evidence of instability of the normal close-packed hexagonal structure was obtained either after cooling or after cold work at various low temperatures. Similarly, the close-packed hexagonal structure of gadolinium was found to be stable to 5°K. (auth)

12464

HIGH ELECTRIC FIELD EFFECTS IN n-INDIUM ANTIMONIDE. M. Glicksman and M. C. Steele (RCA Labs., Princeton, N. J.). Phys. Rev. 110, 1204-5(1958) June 1.

Pulsed current-voltage measurements have been made on a single crystal of n-InSb at 77°K up to a current density of 10^4 amp/cm^2. In order to avoid heating, the data were taken with 1 μsec pulses at a repetition rate of 1 cps. Beyond about 2×10^3 amp/cm^2 the current increased rapidly for small increases in voltage. The electric field at the threshold was about 200 volts/cm for no applied magnetic field. Hall effect measurements at 7000 oersteds showed that the initial carrier concentration of about 2×10^{14}cm^{-3} was increased by a factor of ten in going from the onset of the rapid current increase to the highest current attained. The results are tabulated. (A.C.)

12465

CORRELATIONS SUGGESTING THE d-SHELL CONFIGURATION AND A MAGNETIC EXCHANGE MECHANISM IN IRON GROUP METALS. E. O. Wollan (Oak Ridge National Lab., Tenn.). Phys. Rev. 110, 1205-6 (1958) June 1.

It appears that the orbital properties deduced from crystal field theory are well suited for correlating indirect magnetic exchange phenomena. The possibilities of the orbital approach to the magnetic properties of the transition metals are investigated. (A.C.)

12466

PREDICTED INTERVALLEY SCATTERING EFFECTS IN GERMANIUM. William Shockley (Beckman Instruments, Inc., Mountain View, Calif.). Phys. Rev. 110, 1207-8(1958) June 1.

12467

THERMAL EFFECTS OF THE MARTENSITIC TRANSITION IN SODIUM. Douglas L. Martin (National Research Council, Ottawa, Can.). Phys. Rev. Letters 1, 4-5(1958) July 1.

Specific heat measurements were made on sodium by the method of continuous heating using a modified adiabatic apparatus. The experimental runs were made in the following sequence: (1) sodium sample cooled to 40°K and specific heat measurements made to 98°K;

(2) sample cooled to 40°K and measurements taken up to 100°K; (3) sample cooled to 2°K and measurements then made from about 20°K; (4) sample cooled to 20°K and measurements made up to 92°K; (5) sample cooled to 40°K and measurements made to 84°K. The specific heat of the sample was plotted against temperature from 40 to 100°K. Anomalous deviations from a smooth curve are shown for cases (3) and (4), resulting from the martensitic transition. (L.T.W.)

12468

MAGNETIC FIELD EFFECTS ON BOW SHOCK STAND-OFF DISTANCE. Richard W. Siemer and William B. Bush (Ramo-Wooldridge Corp., Los Angeles). Phys. Rev. Letters 1, 58-9(1958) July 15.

Combined theoretical and experimental investigations have been carried out to determine the effects of applying magnetic fields to the ionized flow about a blunt body of revolution. (W.D.M.)

12469

LARGE-AMPLITUDE HYDROMAGNETIC WAVES ABOVE THE IONOSPHERE. A. J. Dessler (Lockheed Missile Systems, Palo Alto, Calif.). Phys. Rev. Letters 1, 68-9(1958) July 15.

Variations in the density or velocity of the coronal gas will generate hydromagnetic waves at the edge of the earth's dipole field which will be propagated downward and may be observed at the surface of the earth as fluctuations in the geomagnetic field. A curve showing the calculated hydromagnetic wave velocity vs. altitude is presented. (W.D.M.)

12470

THE INTERACTION OF SHOCK WAVES WITH SMALL PERTURBATIONS. I. S. P. D'yakov (Inst. for Physical problems, Academy of Sciences, USSR). Soviet Phys. JETP 6, 729-39(1958) Apr.

The interaction of oblique shock waves of arbitrary intensity with small perturbations is considered in the linear approximation, within the framework of a two-dimensional stationary problem. The flow behind the shock wave is assumed to be supersonic. The general results are applied to the study of the interaction with weak discontinuities, weak shock waves, and with the interface between two media of slightly different acoustical properties. (auth)

12471

INTERACTION OF SHOCK WAVES WITH SMALL PERTURBATIONS. II. S. P. D'yakov (Inst. for Physical Problems, Academy of Sciences, USSR). Soviet Phys. JETP 6, 739-47(1958) Apr.

Consideration is given to the general case of the interaction of small perturbations with a shock wave of arbitrary intensity within the framework of a two dimensional stationary problem in the case of subsonic flow behind the shock wave. A solution is given for the interaction of weak and weak-tangential discontinuities with the shock wave. In both cases, the weak-tangential discontinuity formed behind the shock wave possesses a specific logarithmic discontinuity. (auth)

12472

SUPERCONDUCTIVITY OF BERYLLIUM FILMS CONDENSED ON A COLD BACKING. B. G. Lazarev, A. I. Sudovtsev, and A. P. Smirnov (Physico-Tech. Inst., Academy of Sciences, Ukrainian SSR). Soviet Phys. JETP 6, 816-17(1958) Apr.

Beryllium films obtained by condensation on a backing cooled with liquid helium display superconductivity. The thickness of the measured films was approximately 10^{-6} cm. Films thicker than 10^{-5} cm were not stable and cracked. An exact determination of the transition temperature was not made, but a rough extrapolation of the dependence of the critical current on the temperature yields a value of approximately 8°K. (J.S.R.)

Aerosols

Refer also to abstracts 12168 and 12173.

12473 HW-55172

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

ELECTRONOSCOPIC PARTICLE STUDIES. Progress Report. R. Borasky. May 1, 1958. 15p. Contract W-31-109-Eng-52. $0.50(OTS).

Electron microscope observations and size distribution data of particles collected from aerosols containing $Sr^{90}SO_4$, $Ru^{106}O_2$, or $Pu^{239}O_2$ are presented. (M.H.R.)

12474

THE THEORY OF THE MOTION OF SMALL AEROSOL PARTICLES IN A DIFFUSION FIELD. B. V. Deryagin and S. P. Bakanov (Inst. of Physical Chemistry, Academy of Sciences, USSR). Soviet Phys. (Doklady) 2, 563-7(1957) Nov.-Dec.

The velocity distribution functions for a mixture of gases are derived for the case when the particle radius is much less than the mean free molecular paths. (J.S.R.)

Astrophysics

12475

COSMIC-RAY EVIDENCE ON THE ORIGIN OF METEORITES. S. F. Singer (Univ. of Maryland, College Park). Nuovo cimento (10) 8, 539-48(1958) May 16.

The birth of a meteorite coincides with the breakup of its parent body and also with the beginning of the meteorite's exposure to cosmic rays. This continued exposure creates, through nuclear evaporation, definitely calculable amounts of He^3, about $^2/_3$ of it by way of tritium. Hence the date of breakup can be obtained from the He^3 content; or better still, from the He^3 and tritium content measured in the same sample. However, the latter method has only limited applicability. The two methods give good accord; of six meteorites dated, all are found to be about 300 million years old. This agreement establishes confidence in the calculations of the He^3 production rate and leads to some considerations concerning the process of nuclear excitation. The age is also in good accord with Öpik's calculation of the mean lifetime of meteorite-like bodies against capture by the inner planets. From this agreement conclusions can be drawn concerning the mechanism of meteorite creation and concerning the relative constancy of cosmic-ray intensity as far back as 300 million years. (auth)

Cosmic Radiation

Refer also to abstracts 12134 and 12475.

12476 AFOSR-TN-57-432

New Mexico. Univ., Albuquerque.

PRELIMINARY REPORT ON THE DEVELOPMENT OF A LARGE SCINTILLATOR FOR OBSERVATION OF EXTENSIVE AIR SHOWERS. John R. Green. June 20, 1957. 6p. Contract AF49(638)-34. (AD-136422).

A large scintillator was constructed for the purpose of investigating high-energy extensive air showers of cosmic radiation. (auth)

12477 NP-6818
Rochester, N. Y. Univ.
THE FLUX OF COSMIC RAY PARTICLES WITH Z ≥ 2 OVER TEXAS. A. Engler, M. F. Kaplon, and J. Klarmann. [1958]. 34p.

The fluxes of multiply charged cosmic-ray particles have been measured with nuclear emulsions in a high-altitude balloon flight. The identification of α particles was based on "blob-gap" measurements while those of elements with Z ≥ 3 on δ-ray densities. The charge resolution obtained was satisfactory. To calculate the fluxes at the top of the atmosphere an extrapolation procedure was employed. Two sets of parameters which account for the interactions in the residual atmosphere, differing considerably as far as their influence on the fluxes of light elements is concerned, were used. (auth)

12478
NATURE OF THE CURRENT REDUCTION IN THE PRIMARY COSMIC-RAY INTENSITY. M. A. Pomerantz, S. P. Agarwal, and V. R. Potnis (Franklin Inst., Swarthmore, Penna.). Phys. Rev. Letters 1, 65-8(1958) July 15.

The possible causes for the intensity decrease in primary cosmic rays as compared to the 1949-50 level are investigated. (W.D.M.)

Crystallography and Crystal Structure

12479 AECU-3765
Massachusetts Inst. of Tech., Cambridge. Lab. for Insulation Research.
ELECTRICAL AND OPTICAL INVESTIGATION OF CHARGE-CARRIER TRAPPING IN RUTILE SINGLE CRYSTALS. Technical Report No. 27. K. G. Srivastava. June 1958. 29p. Contract AT(30-1)-1937. $4.80(ph OTS); $2.70(mf OTS).

Low-frequency absorption centers, observed by electrical measurements in single crystals of rutile, can be produced by thermal quenching or optical irradiation in the edge of the eigen absorption region (4200 A). They are observed when electric fields are applied parallel to the optic axis (crystallographic c axis) and are not visible with the field perpendicular to this axis. The temperature dependence of the principal dispersion indicates an activation energy of 0.18 ev. The centers can be explained by a localized electron transfer process along the optic axis. The introduction of silver and copper by thermal diffusion did not produce low frequency absorption spectra. (auth)

12480 AFOSR-TN-58-355
AFOSR-TN-58-356
AFOSR-TN-58-357
Turin. Istituto Elettrotecnico Nazionale Galileo Ferraris.
THERMOLUMINESCENCE AND F CENTERS. PARTS I, II, AND III. Technical Note Nos. 1b, 2b, and 3b. Guido Bonfiglioli, Piero Brovetto, and Cesare Cortese. [1958]. (Pt. I, 12p.; Pt. II, 16p.; and Pt. III, 14p.). Contract AF61(514)-1333.

These reports (further identified as AD-154260; AD-154261; and AD-154262, respectively) were issued separately, but are cataloged as a unit.

The interpretation of the thermoluminescence experiments according to current theories is critically reviewed, and the inconsistency of this interpretation is shown with reference to the thermoluminescence associated with the F centers in alkali halides. The results and techniques of experiments with sodium chloride powders previously irradiated with x rays, beta rays, or gamma rays from a 31-Mev betatron are discussed, and a model to interpret F-center thermoluminescence in irradiated sodium chloride is presented in first approximation. (J.R.D.)

12481
THE IMPROVEMENT OF THE CRYSTAL STRUCTURE DETERMINATION OF SOME RUTILE TYPE COMPOUNDS. II. THE DIFLUORIDE OF Mn, Fe, Co, Ni, and Zn. Werner H. Baur (Univ. of Göttingen, Ger.). Acta Cryst. 11, 488-90(1958) July. (In German)

The atomic parameters of the rutile-type compounds MnF_2, FeF_2, CoF_2, NiF_2, and ZnF_2 have been redetermined. I_{hk0} of these crystals were obtained by careful photometry of Weissenberg photographs (Mo Kα radiation) and were used for Fourier and $(F_o - F_c)$ projections. Results: MnF_2, x = 0.305; FeF_2, x = 0.300; CoF_2, x = 0.306; NiF_2, x = 0.302; ZnF_2, x = 0.303. These results show that in the MF_6 octahedra of all these compounds two of the M-F distances are shorter than the four others. This is most pronounced in FeF_2, where the difference in bond lengths is more than 6%. (auth)

12482
A NEUTRON STRUCTURE ANALYSIS OF TETRAGONAL $NH_4H_2PO_4$. Leon Tenzer (Brookhaven National Lab., Upton, N. Y.), B. C. Frazer (Westinghouse Research Labs., Pittsburgh), and Ray Pepinsky (Pennsylvania State Univ., University Park). Acta Cryst. 11, 505-9(1958) July.

The structure of tetragonal $NH_4H_2PO_4$ has been determined in a single-crystal neutron-diffraction study The N-H ... O and O-H ... O bond systems suggested in earlier x-ray investigations were confirmed. The $H_2PO_4^-$ network is very similar to that found in KH_2PO_4; the only significant difference observed was in the angle between the P-O and O-H ... O bonds. The ammonium ion was found to be only slightly distorted from a regular tetrahedral arrangement. Considerable distortion would be necessary for linear N-H ... O bonds. The observed angle between the N-H bond and the line joining nitrogen and oxygen centers was about 14°. In order to achieve good agreement between calculated and observed data, it was necessary to introduce anisotropic thermal vibration parameters. The final value of the discrepancy factor was 8.9%. (auth)

12483
WHISKER GROWTH FROM IODIDE TITANIUM WIRE. Allan M. Russell and Robert C. Abbott (Syracuse Univ., N. Y.). J. Appl. Phys. 29, 1130-1(1958) July.

Recent studies of whisker growth on metals have involved the heating of small samples of the metal in air, at reduced pressure of oxygen, or the prolonged exposure of the sample to atmosphere. The only metal whiskers grown in vacuo appear to be those, such as mercury, which can be grown from the vapor phase. A method is described for growing titanium whiskers from the pure metal in vacuo. (A.C.)

12484
TYPES OF MAGNETICALLY ORDERED CONFIGURATIONS ON SIMPLE LATTICES. H. A. Gersch and W. C. Koehler (Oak Ridge National Lab., Tenn.). Phys. and Chem. Solids 5, 180-201(1958) May.

A scheme for enumerating possible magnetically

ordered configurations on simple lattices is described, and a system of nomenclature descriptive of the arrangement is proposed. Examples of the method as applied to simple cubic, face-centered cubic, body-centered cubic, and hexagonal layer lattices are given. Magnetic structure amplitudes for configurations based on the above lattices are tabulated. (auth)

12485

INTERMEDIATE STATE OF SUPERCONDUCTORS: INFLUENCE OF CRYSTAL STRUCTURE. A. L. Schawlow and G. E. Devlin (Bell Telephone Labs., Murray Hill, N. J.). Phys. Rev. 110, 1011-16(1958) June 1.

The structure of the intermediate state has been studied in tin single crystals. In the purest crystals, an anisotropy is observed which is caused by the anisotropic resistance of the normal phase. The anisotropy of the structure changes sign as the temperature is lowered because of the very large magnetoresistance of pure tin. Superconducting-normal boundary (surface) energy values for tin single crystals have been measured and agree with those found earlier for polycrystalline tin samples. Boundary energy values for thallium have also been measured and agree with theoretical predictions. (auth)

12486

MAGNETORESISTANCE SYMMETRY RELATION IN n-GERMANIUM. Colman Goldberg and W. E. Howard (Westinghouse Research Labs., Pittsburgh). Phys. Rev. 110, 1035-9(1958) June 1.

Careful measurement of the weak-field magnetoresistance coefficients of n-germanium indicates that the magnetoresistance symmetry relation is obeyed for samples with carrier concentrations as high as 6×10^{15} cm^{-3}. For a 3×10^{16} sample, the deviation, if any, is still quite small. For samples with carrier concentrations of 4×10^{17}, 1×10^{18}, and 1×10^{19}, there is definite evidence of deviation but there is no evidence of the large deviations previously reported. The values of the anisotropy parameter K obtained from these measurements are in agreement with values previously obtained from magnetoconductance measurements. (auth)

12487

DICHROISM OF THE F AND M BANDS IN KCl. Hiroshi Kanzaki (Univ. of Illinois, Urbana). Phys. Rev. 110, 1063-8(1958) June 1.

The dichroism of the F and M absorption bands that can be produced by optical bleaching of the F band with polarized light at 87°K is critically dependent on the concentrations of F and M centers. The changes in half-widths and peak positions of the F and M bands that accompany the development of dichroism suggest that the F-band dichroism is due to a spatial association of F and M centers. It is probable that an excited F center can transfer energy to a neighboring M center. Dichroism of the F and M bands can be produced at room temperature by optical bleaching of either band with polarized radiation. (auth)

12488

COLOR CENTERS IN KCl CONTAINING Li^+ OR Na^+. Masakazu Ishiguro and Etsu Sugioka (Osaka Univ.). Phys. Rev. 110, 1070(1958) June 1.

A new absorption band has been discovered in KCl crystals containing Li^+ or Na^+ ions. The conditions for formation of this band and its behavior during thermal or optical bleaching indicate that it is due to a center similar to the B center of crystals containing Ag^+. The model of the B center proposed by Etzel and Schulman is assumed and a mechanism for its formation is proposed. (auth)

Electrical Discharge

12489 AERE-T/R-1347

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE VISCOUS DISCHARGE. A NEW MODEL OF THE HIGHLY IONIZED GAS DISCHARGE. S. J. Roberts and W. B. Thompson. Feb. 1954. Decl. May 1, 1957. 15p.

A new model is proposed for the highly ionized discharge, which it is hoped will avoid some of the difficulties associated with the diffusion model. It is shown that viscous forces can be important in a highly ionized discharge, and the differential equation for the density distribution is derived. (A.C.)

12490 AERE-T/R-2503

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

HYDROMAGNETIC INSTABILITIES OF A CYLINDRICAL GAS DISCHARGE. PART 6. ENERGY PRINCIPLE CALCULATIONS FOR AXISYMMETRIC PERTURBATIONS. M. H. Boon, E. W. Laing, J. Randles, S. J. Roberts, and R. J. Taylor. Mar. 1958. 45p.

Stable gas discharge configurations were shown to exist, in which the discharge current flows entirely on its surface. The finite electrical conductivity of the discharge causes the thickness of the current layer to increase and eventually the discharge becomes unstable. Stability against axisymmetric perturbations was studied using a variational procedure developed at Princeton. For one simple evolutionary sequence of discharge configurations, stability is lost when the current layer has a thickness of about 15% of the discharge radius. Approximate stability criteria are found for more general discharge configurations which are not linked in an evolutionary sequence. (auth)

12491 AERE-TP/R-2374

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

HYDROMAGNETIC INSTABILITIES OF A CYLINDRICAL GAS DISCHARGE. R. J. Tayler. Jan. 1956. Decl. July 1957. 52p. $1.26(BIS).

Decl. version of AERE-T/R-1859.

Hydromagnetic instabilities of a simple model of a cylindrical gas discharge have been studied by Kruskal and Schwarzschild. In this report their methods are extended by the introduction of several additional factors and the consideration of more general disturbances of the equilibrium position. Methods of stabilizing the discharge have been considered, but in all the models of this report some instabilities remain. Indication is given of problems involved in a more realistic study of the discharge. (auth)

12492 CEA-729

France. Commisariat à l'Énergie Atomique, Paris.

OBSERVATION SPECTROGRAPHIQUE DE DÉCHARGES. A FORTE INTENSITÉ. (Spectrographic Observations of High Intensity Discharges.) C. Breton, J. Charon, P. Hubert, and P. Yvon. 1957. 10p.

Presented at Third International Conference on the Phenomenon of Ionization in Gas, held June 11-15, 1957.

During straight discharges in deuterium at low pressure, the production of x rays and neutrons was observed. Spectroscopic observation of the light emitted reveals a broadening of the Balmer lines. From this a mean ionic density of the order of 10^{18} ions/cm^3 is deduced. (auth)

12493 NYO-7981

New York Univ., New York. Atomic Energy Commission Computing and Applied Mathematics Center.
EXPERIMENTS ON SUPERSONIC PLASMA FLOW ALONG MAGNETIC FIELDS. D. Finkelstein, M. Ehrlich, I. Livingston, and D. Wetstone. Mar. 27, 1958. 48p. $7.80(ph OTS); $3.30(mf OTS).

Observations are reported of two-dimensional confinement of a vacuum spark discharge plasma in axial magnetic fields up to twenty kilogauss, with supersonic axial plasma velocities observed of two to three centimeters per microsecond. Velocity appeared to increase slightly with field. Confinement up to one meter was observed in experimental tubes down to one inch in diameter. When flux lines were diverted or radially compressed within the tube, the plasma appeared to follow approximately the diverted lines in the manner suggested by theory. (auth)

12494 SCR-30

Sandia Corp., Albuquerque, N. Mex.
DERIVATION FROM BOLTZMANN'S EQUATION OF THE SIMILARITY LAWS FOR LOW-PRESSURE DISCHARGES. T. E. VanZandt. [Oct. 1956.] [Issued] June 1958. 12p. Contract AT-(29-1)-789. $1.80(ph OTS); $1.80(mf OTS).

Presented at the Gaseous Electronics Conference, Pittsburgh, Penna., Oct. 31–Nov. 3, 1956.

The similarity laws are derived by requiring that in two geometrically similar discharges the normalized distribution functions, and hence the Boltzmann equations for the normalized distribution functions, be the same function of the dimensionless coordinates of the two discharges. Also it is shown that if a discharge is stable, discharges similar to it are stable. (auth)

12495

THE "FOURTH CONDITION OF REFLECTION" OF ELECTROMAGNETIC WAVES IN A PLASMA. Karl Rawer and Kurt Suchy. Compt. rend. 246, 3428-30 (1958) June 23. (In French)

A term, generally negligable in the Boltzmann equation, is introduced modifying the function normally used in magneto-ionic theory. (auth)

12496

CONTOURS OF LINES OF IONS IN A PLASMA OF A POSITIVE COLUMN OF A GAS DISCHARGE. V. M. Zakharova. Optika i Spectroskopiya 1, No. 5, 636-41 (1956). (Translated from Referat. Zhur. Khim. No. 6, 1957, Abstract No. 18109.)

The contours of lines of Ar ions in the plasma of the positive column of a gas discharge are investigated. The discharge tube is 140 mm long and 4 mm in diam. The gas pressure at the discharge varied from 0.5 to 2.0 mm of Hg, and the intensity of the discharge current was between 0.2 and 2.2 amp. The contours were photographed across and along the tube with a Fabry-Perot etalon. The temperature of the medium was maintained with an accuracy of 0.1°. The temperature of the ions was determined by the usual formulas from the half-width of the spectral lines. The directed velocity of the ions was determined by the displacement of the ion lines when observed along the direction of the field and against the field. Diagrams are given which show that the directed velocity of ions and the ion temperatures depend on the intensity of the discharge current at various pressures. The curves for the directed velocity and ion temperatures have maxima at identical current densities. The ion temperatures increase with the increase of the intensity of the discharge current. (J.S.R.)

12497

INSTABILITY, TURBULENCE, AND CONDUCTIVITY IN CURRENT-CARRYING PLASMA. O. Buneman (Stanford Univ., Calif.). Phys. Rev. Letters 1, 8-9(1958) July 1.

In fully ionized plasma, close (large-angle) collisions between particles in appreciable relative motion are rare. However, collective Coulomb interactions (i.e., small-angle collisions) cause instabilities which grow so rapidly that relative motion of ions and electrons, i.e., currents, are continually damped down by conversion of directed energy into random fluctuation energy. The mechanism of this phenomenon is explored mathematically. (L.T.W.)

12498

NEUTRONS OF POSSIBLE THERMONUCLEAR ORIGIN. W. C. Elmore, E. M. Little, and W. E. Quinn (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. Letters 1, 32-4(1958) July 1.

Neutrons were produced from a deuterium plasma compressed by a rising axial magnetic field. The device used, named Scylla, at present employs three single-turn coils. The emission of both x rays and neutrons were observed during the second and to a lesser extent later compressions. X rays, when observed, occur during the beginning and the end of a compression cycle when the electric field is high. In contrast, neutrons occur only in summetrical bursts lasting about 1 μsec centered on the instant of compression. (M.H.R.)

12499

ON THE THEORY OF DIFFUSION OSCILLATIONS IN A GAS DISCHARGE PLASMA. O. V. Prudkovskaia (M. V. Lomonosov Moscow State Univ.). Soviet Phys. (Doklady) 2, 521-4(1957) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 6681.

12500

X RAYS FROM A STRONG PULSED DISCHARGE IN XENON. I. M. Podgornyi and S. A. Chuvatin. Soviet Phys. (Doklady) 2, 543-5(1957) Nov.-Dec.

An investigation was made of gas discharge x rays occurring in xenon and in mixtures of hydrogen and xenon. The experiments were made under initial gas pressures ranging from 5×10^{-3} to 5×10^{-1} mm Hg. The course of the discharges differs in hydrogen and xenon under identical experimental conditions. The voltage curve of a discharge in hydrogen shows sharp peaks, but the peaks are absent in a xenon discharge. Identical pulse lengths were observed in both hydrogen and xenon, the x-ray energy in hydrogen reaches a few hundred kev, while in xenon it does not exceed 10 to 15 kev. No starting x-ray pulse was observed. The dependence of the x-ray intensity on the pressure and on the total mass of the mixture was determined. (J.S.R.)

12501

SIGN OF THE SPACE CHARGE ON THE AXIS OF A POSITIVE COLUMN IN A LONGITUDINAL MAGNETIC FIELD. M. V. Konyukov (Tula Pedagogical Inst.). Soviet Phys. JETP 6, 798-9(1958) Apr.

The ratio of the transverse gradients near the axis in a magnetic field and without the field is derived for the case of a light element and for a heavy element. The magnetic field at which the transverse gradient vanishes for a heavy element is determined. The equations were compared with experimental results obtained for neon, but no experimental results were available for heavy elements. (J.S.R.)

Electrons

12502 NP-6791

Cornell Univ., Ithaca, N. Y.

THE DIFFRACTION OF ELECTRONS BY THIN FILMS. Final Technical Report. Dept. of Chemistry. S. H. Bauer. Feb. 1, 1958. 221p. Project No. NR-356-296. Contract Nonr-401(06).

A series of electron diffraction studies, both experimental and theoretical, is presented. Section A is devoted to a brief description of apparatus used in the experiments. In section B the development of quantitative methods for estimating intensities in diffraction patterns produced by 50-kv electrons impinging on thin films and on the outer layers of crystallites is described. In section C the radial distribution method is discussed and empirically tested. Section D is an abstract of a thesis on the precision determination of lattice parameters of polycrystalline specimens giving broad diffraction peaks. Section E is a literature survey of theoretical and experimental work on surface energies of microcrystallites and of the distortions in the outer layers which accompany such surface effects. Section F covers the experimental studies of collodion films. Section G is a theoretical analysis of the electron diffraction shape factor for a thin film. Section H consists of two treatments of the vexing and difficult problem of plural and multiple electron scattering by thin films and microcrystallites. Section J is an abstract of a thesis on the measurement of contact potentials of freshly evaporated films of Ag, Cu, and Al and changes in these films due to adsorption of hydrogen and oxygen. (W.L.H.)

12503

AN APPARATUS FOR MEASURING ELECTRON ATTACHMENT: RESULTS FOR OXYGEN IN ARGON. T. E. Bortner and G. S. Hurst (Oak Ridge National Lab., Tenn.). Health Phys. 1, 39-45(1958) June.

The time variation of the electrostatic potential of a plane electrode ionization chamber, due to the motion of electrons in the uniform field, depends on the drift velocity of electrons and the attachment of the electrons to the gas in the chamber. If the pulse is examined with a linear pulse amplifier having suitable integration and differentiation time constants, the pulse height will be a simple analytical function of the attachment coefficient and the electron drift velocity. This information has been used to develop a pulse method of measuring electron attachment. In one section of a plane electrode ionization chamber the pulse height due to the motion of electrons, produced by alpha particle ionization, is measured. Drift velocity of electrons is measured in another part of the same ionization chamber. These two measurements furnish data from which the attachment coefficient is calculated. Results for trace amounts of oxygen in argon will be presented. (auth)

12504

CIRCULAR POLARIZATION OF A^{37} INTERNAL BREMSSTRAHLUNG. Lloyd G. Mann, John A. Miskel, and Stewart D. Bloom (Univ. of California, Livermore). Phys. Rev. Letters 1, 34-6(1958) July 1.

The internal bremsstrahlung polarization of Ge^{71} was found to be only 40% of full polarization. The present result for Ar^{37} indicates full positive polarization to within 15%, confirming the surmise that Ge^{71} result was very likely affected by source impurities and multiple scattering, and supporting the full validity of the two-component theory The technique used was similar to that introduced by Schopper and Boehm and Wapstra. (M.H.R.)

12505

ON THE SEMICLASSICAL INTERPRETATION OF QUANTUM EFFECTS IN THE THEORY OF THE RADIATING ELECTRON. A. A. Sokolov and I. M. Ternov (M. V. Lomonosov Moscow State Univ.). Soviet Phys. (Doklady) 2, 573-6(1957) Nov.-Dec.

A semiclassical interpretation of quantum effects associated with the motion of an extreme relativistic electron in a magnetic field is presented. (J.S.R.)

12506

RADIATION FROM AN ELECTRON TRAVERSING A SLAB. V. E. Pafomov (P. N. Lebedev Physics Inst., Academy of Sciences, USSR). Soviet Phys. JETP 6, 829-30(1958) Apr.

The results of calculations on the angular distribution of the radiation emitted by a charge moving perpendicularly to a slab placed in a vacuum are presented. (J.S.R.)

Gases

12507 UCRL-5212

California. Univ., Livermore. Radiation Lab.

THE SLOWING-DOWN DISTRIBUTION OF ENERGETIC NUCLEI IN A FULLY IONIZED GAS. Ray E. Kidder. May 6, 1958. 11p. Contract W-7405-eng-48. $0.50 (OTS).

The steady-state energy distribution is obtained for a group of initially monoenergetic charged particles slowing down in a fully ionized gas. The distribution function is obtained analytically by solving the Fokker-Planck equation in energy space. With reference to thermonuclear reactions, the results obtained suggest that in some situations the contribution of the slowing-down distribution to the reaction rate may be significant. (auth)

12508 UCRL-5213

California. Univ., Livermore. Radiation Lab.

ENERGY TRANSFER BETWEEN CHARGED PARTICLES BY COULOMB COLLISIONS. Ray E. Kidder. May 12, 1958. 21p. Contract W-7405-eng-48. $0.75(OTS).

The theory of energy transfer between charged particles in a fully ionized gas is reviewed, and calculations are made of the rate at which energy is transferred from electrons at a temperature T to cooler ions. The interaction between ion and electron is assumed to be of the Debye form $(Ze/r)\exp(-r/\lambda)$, where λ is the Debye shielding length. It is suggested that future improvements of the theory of Coulomb interactions in ionized gases are likely to be made in two ways: through employing an effective potential derived on the basis of quantum statistics for the electrons and through improvements in the two-body approximation to the many-body problem. (auth)

12509

THE SCATTERING OF BEAMS OF ALKALI ATOMS IN VARIOUS GASES. I. SODIUM AND ARGON. Kumasaburo Kodera and Teijiro Tamura (Kyoto Technical Univ., Sakyo-ku). Bull. Chem. Soc. Japan 31, 206-10(1958) Mar.

An apparatus is described for measuring molecular beam intensity in vacuo and in a scattering gas. The collision radius is calculated. Data are given for sodium and argon and discussed. (T.R.H.)

12510

EXCITATION AND DISSOCIATION OF HYDROGEN BY AN ELECTRON SWARM. S. J. B. Corrigan and A. von Engel (Univ. of Oxford). Proc. Roy. Soc. (London) A245, 335-51(1958) June 24.

A novel method of intensity measurements by counting quanta vacuum ultraviolet radiation has been developed, using a fluorescent converter, photomultiplier and scaler, to obtain the absolute magnitude of the excitation coefficient as a function of the electric field. The absolute intensity of the radiation was found by means of a photochemical reaction of known quantum efficiency. With electron currents up to 10^{-8}A it was shown that the emitted flux of ultraviolet quanta was proportional to the current and varied exponentially with distance from the cathode, in agreement with theory. The rate of dissociation of molecular hydrogen in an electrodeless discharge was measured by absorbing the atomic hydrogen formed and observing the rate of decrease of gas pressure. From this and electric data a dissocation coefficient was calculated showing that dissociation losses account for a large part of the energy balance. It seems that dissociation proceeds principally by electronic excitation from the ground state $1^1\Sigma_g$ to the lowest repulsive state $1^3\Sigma_u$. An average cross-section of $0.2\pi a_0^2$ has been obtained for this transition in moderate electric fields. (auth)

12511

OPTICAL DETERMINATION OF THE DENSITY OF He^3. V. P. Peshkov (Inst. of Physical Problems, Academy of Sciences, USSR). Soviet Phys. JETP 6, 645-8(1958) Apr.

An interference method is described for determining the density of gaseous and liquid He^3. It is found that for He^3 the molar polarization A = 0.123 cm^3/mole. It is shown that at temperatures and pressures below the critical values the equation of state for gaseous He^3 is described by the formula $p/\rho = 27.35T - 2.3 \times 10^3\rho + 1.8 \times 10^4\rho^2$, where p/ρ is expressed in atm cm^3/g. The compressibility curves for liquid He^3 are determined. For the critical point the values $T_c = 3.38 \pm 0.03$°K, $p_c = 930 \pm 20$ mm Hg, and $\rho_c = 0.041 \pm 0.01$ g/cm^3 are obtained. (auth)

Instruments

12512 AERE-EL/M-103

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

AN AUTOMATIC SUBTRACTION CIRCUIT FOR THE HUTCHINSON-SCARROTT PULSE AMPLITUDE ANALYSER. C. N. Davey. Feb. 1958. 11p.

A switching circuit enables subtraction of one spectrum from another to be carried out by the analyzer. (auth)

12513 AERE-R/R-2484

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

INSTRUMENTS FOR THE MEASUREMENT OF PRESSURE AND DIFFERENTIAL PRESSURE OF HIGH TEMPERATURE FLUIDS. S. T. Naish and T. R. Moss. Apr. 1958. 13p.

Instruments for the measurement of pressure and differential pressure are reviewed. At the time of writing no commercial instruments are considered suitable for operation in liquid bismuth or other fluids at high temperature in the range 200 to 550°C. Several prototype designs which have been tested for short periods are discussed. From these, two pressure transmitters and one differential pressure transmitter are recommended. (auth)

12514 NP-6828

Radiation Research Corp., New York.

NUCLEAR BATTERIES. Quarterly Progress Report No. 3 [for] May 15, 1957—August 15, 1957. John H. Coleman. 25p. DA Project No. 3-9-09-000. Contract DA-36-039-SC-73115.

Three tritium battery types models R, R_B, and R2 were produced and tested. Life data extending over three months indicate the output current decreases with time due to the presence of internal gas. A preliminary analysis indicates the source of this gas is the carbon collector which was vacuum baked at 150°C maximum due to the low operating temperature of the tritium–titanium source. Literature references indicate the quantity of gas retained is a function of temperature; therefore, the production process using a bell jar system was changed to allow a vacuum bake above 1000°C. The construction of this basic system was completed and development is underway on refining techniques to obtain highest vacuum integrity. (auth)

12515 ORNL-2483

Oak Ridge National Lab., Tenn.

HIGH TEMPERATURE PRESSURE TRANSMITTER EVALUATION. W. R. Miller. July 21, 1958. 40p. Contract W-7405-eng-26. $1.25(OTS).

Several designs of primary high-temperature pressure transmitters which would withstand the corrosive attack of liquid metals at elevated temperature and demonstrate the success of the design by operating for 3000 hr without maintenance were submitted. The instrument meeting the requirements was Model TN 1103 designed by the Taylor Instrument Co. The reasons for the choice were given. (J.E.D.)

12516 SCR-25

Sandia Corp., Albuquerque, N. Mex.

MODIFICATION OF A DAMPOMETER FOR USE WITH A FREE-OSCILLATION DYNAMIC RIG. R. C. Maydew. [Oct. 1957. Issued] June 1958. 5p. Contract AT(29-1)-789. $1.80(ph OTS); $1.80(mf OTS).

Presented at the Eighth Meeting of the Supersonic Wind-Tunnel Assoc., Seattle, Wash. Oct. 1957.

The Dampometer represents a harmonically damped oscillation by a rotating vector in such a way that the length of the vector is proportional to the damping. The device was designed for use with a forced oscillation dynamic testing, and its modification for use with a free oscillation rig is described. (T.R.H.)

12517 SCR-28

Sandia Corp., Albuquerque, N. Mex.

SOME CAUSES AND REMEDIES FOR UNDESIRABLE VARIABILITY OF RELAY PERFORMANCE CHARACTERISTICS. Jay W. Grear, Jr. [Apr. 1958.] [Issued] June 1958. 13p. Contract AT-(29-1)-789. $3.30 (ph OTS); $2.40(mf OTS).

Presented at the Sixth National Conference on Electromagnetic Relays, School of Electrical Engineering Oklahoma State Univ., Stillwater, Okla. Apr. 1958.

A discussion is presented of some causes and remedies for undesirable variability of relay performance characteristics within individual relays, and between relays within a lot, and from lot to lot. Discussed are test results, methods of determining the causes for instability (including the replica technique for studying contact contamination), and examples of corrective action taken to decrease the instability. Recommendations are made concerning steps to improve the designs, to stabilize the performance characteristics during preproduction and production fabrication, and to obtain useful information during final testing. (auth)

12518 SCR-29

Sandia Corp., Albuquerque, N. Mex.

STANDARD CLEARANCE HOLE SIZES. C. I. Millard. June 1958. 13p. $3.30(ph OTS); $2.40(mf OTS).

Reprinted with revisions from SCTM-133-56(16). Abridged version published in Prod. Eng. May 12, 1958.

This study establishes standard clearance hole sizes for the common screw fastener sizes, positional tolerances and assembly applications. These clearance hole sizes are expressed as standard drill sizes in the tables. In arriving at these drill sizes, consideration was given to the fact that drills cut oversize and that deviations in the size of drilled holes must be expected even under ideal operating conditions. (auth)

12519 SCL-T-175

AN ALTERNATING-CURRENT [STANDARD BASED] ON THE PHOTOELECTRIC PRINCIPLE. (Ein Wechselstromnormal auf Lichtelektrischer Grundlage). Rudolf Sewig and Gottried Werkmeister. Translated by Marcel I. Weinreich from Z. tech. Phys. 22, 248-51 (1941). 11p.

The problem of measuring alternating currents is discussed. The device developed is based on the Joule heat generated by the currents to be compared. Such an indicator can be calibrated with a direct current and makes possible the "compensation" of alternating currents against exactly measurable direct currents. This device is similar to Mall's thermo-transformer in the symmetrical construction of the a-c and d-c circuits. The difference lies in the fact that the heating wires of the thermo-transformer are replaced by incandescent bulbs, and the thermo-columns by photo-elements. (M.H.R.)

12520

A WAY TO STABILIZE REACTOR INSTRUMENT POWER SUPPLIES. J. Parnell and C. W. Sundin (Minneapolis-Honeywell Regulator Co., Philadelphia). Nucleonics 16, No. 7, 102-3(1958) July.

A method of smoothing out line voltage and preventing false scrams by placing an inertia-loaded motor-generator set across the line is presented. The set is an induction motor and an alternator with a shaft-mounted exciter, arranged so that energy stored in a flywheel generates current when line supplies falter. The selection of the stabilizer and alternative are discussed. (M.H.R.)

12521

RADIATION-RESISTANT MOTORS FOR NUCLEAR AIRCRAFT CONTROLS. R. C. Fries (General Electric Co., Cincinnati). Nucleonics 16, No. 7, 103-4(1958) July.

Results are given which indicate that electric motors stand up well to reactor radiation and high temperatures. Temperature damaged the motors more than limited exposure to neutrons and gamma rays. Radiation effects on the individual components and materials of the motors are discussed. (M.H.R.)

12522

APPARATUS FOR MEASURING THE AZIMUTHAL FIELD SYMMETRY OF POWERFUL ELECTROMAGNETS. M. P. Zel'dovich and S. M. Rubchinskii. Pribory i Tekh. Ekspt. No. 1, 56-8(1958) Jan. (In Russian)

An instrument for measuring the azimuthal field symmetry of powerful electromagnets with annular pole tips at field deflections of ~10 ke of the azimuthal symmetry over 0.05% is described. (tr-auth)

12523

INVESTIGATIONS OF THE INTERMITTENT PROPERTIES OF PHOTOMULTIPLIERS BY THE METHOD OF RETARDED COINCIDENCES. E. E. Berlovich and B. A. Shilyaev (Physico-Tech. Inst., Academy of Sciences, USSR). Pribory i Tekh. Ekspt. No. 1, 62-8 (1958) Jan. (In Russian)

The method of retarded coincidences was used for calculation of the rise time of electron multipliers. For the photomultiplier model-1B the rise time was in the range (1 to 2) $\times 10^{-9}$ sec, for the model-19 it was ~4.5×10^{-9} sec. The influence of the rise time of the photomultiplier pulse current on the intermittent measurements was investigated. The stilbene scintillation time in the coincidence scheme for 1B was 5.7×10^{-9} sec. The measurements of the half life of decay for excited nuclei Pr^{141} showed $T_{1/2} = 2.0 \times 10^{-9}$ sec and for Tl^{203} $T_{1/2} = 2.7 \times 10^{-10}$ sec. The efficiency of the coincidence scheme for the model-1B is close to 100% with $2\tau_0 = 7 \times 10^{-9}$ sec, and for the model-19 the saturation point is at $2\tau_0 = 2.6 \times 10^{-8}$ sec. (tr-auth)

12524

DIFFERENTIAL TIME ANALYZER FOR MEASURING TIME INTERVAL 10^{-8} TO 10^{-10} SEC. E. E. Berlovich (Physico-Tech. Inst., Academy of Sciences, USSR). Pribory i Tekh. Ekspt. No. 1, 68-72(1958) Jan. (In Russian)

An apparatus is described for measuring short intervals of time by the retarded coincidence method which permits the selection of coincidence pulses by their amplitudes and excludes the influence of various pulse coincidences. The resolving time of the coincidence system with the model-1B multiplier is $2\tau_0 = 2 \times 10^{-9}$ sec which permits the measurement of time intervals up to 10^{-10} sec. (tr-auth)

12525

AMPLITUDE ANALYZER WITH DELAY LINES. G. R. Kartashev. Pribory i Tekh. Ekspt. No. 1, 73-6(1958) Jan. (In Russian)

An amplitude analyzer is described based on the principle of intermittent-amplitude transformations and combining the scheme of delay-line distribution of pulses along the channels. (tr-auth)

12526

AMPLIFIER WITH A COMPLEX CORRECTION SCHEME FOR RECORDING COINCIDENCES. V. B. Ustinov and V. A. Sergienko (Leningrad State Univ.). Pribory i Tekh. Ekspt. No. 1, 76-8(1958) Jan. (In Russian)

A two-channel amplifier with a complex correction scheme and a pass band of 50 MHz with an amplification factor of 10^3 is described. The amplifier is designed for recording coincidences. The resolving power of the coincidence scheme is equal to $2\tau = 6 \times 10^{-9}$ sec. (tr-auth)

12527

HIGHLY SENSITIVE SPECTRAL ANALYZER OF LOW FREQUENCY ELECTRICAL NOISES. A. N. Malakhov (Gor'kii State Univ.). Pribory i Tekh. Ekspt. No. 1, 79-82(1958) Jan. (In Russian)

A spectral analyzer for measuring spectral densities of low-frequency electrical noises in the frequency range 1 to 300 Hz is described. The instrument is a single heterogeneous system with a 1 Hz band, a sensitivity of 10^{-16} v^2/Hz, and a time constant of 20 sec. Measurements of low-frequency electrical fluctuation spectra of gas discharge lamps are included. (tr-auth)

12528

HIGH-VOLTAGE MULTIPULSED GENERATOR. A. P. Komar and N. N. Chernov (Physico-Tech. Inst., Academy of Sciences, USSR). Pribory i Tekh. Eksp. No. 1, 82-4(1958) Jan. (In Russian)

12529

GRID CURRENT IN ELECTRON TUBES. E. Fairstein (Oak Ridge National Lab., Tenn.). Rev. Sci. Instr. 29, 524-6(1958) June.

The outcome of an experimental study of grid current in currently produced low-power receiving tubes indicates that if the plate dissipation is kept below 75% of the manufacturers' ratings, the grid current is not primarily due to ionized gas, but to photoelectric emission from the grid under the action of soft x rays produced at the plate. A simple empirical formula is given for predicting the grid current from the operating conditions. Data are given for 11 tube types. (auth)

12530

FOUR-GUN OSCILLOSCOPE FOR USE IN NUCLEAR RESEARCH. Horace G. Jackson (Univ. of California, Berkeley). Rev. Sci. Instr. 29, 527(1958) June.

A unit was built around a four-gun cathode-ray tube which is quickly mounted to a Textronix Type 517 oscilloscope. The tube was a Dumont type K1479P11M having four independently deflected and focused beams. (W.D.M.)

12531

TO THE THEORY OF IONIZATION MANOMETER. L. P. Khavkin. Zhur. Tekh. Fiz. 26, No. 10, 2356-60 (1956). (Translated from Referat. Zhur. Khim. No. 8, 1957, Abstract No. 27339.)

Simple approximation formulas are proposed which describe more satisfactorily the probability function and the ionization efficiency in a wider range of electron energies than previous theories. Formulas, based on the theory of the ionization manometer of Morgulis and his proposed approximations, connecting the sensitivity of the manometer with its geometrical dimensions and electrical parameters are derived. A comparison is made of theoretical and experimental data. (J.S.R.)

12532

HIGH TEMPERATURE PRESSURE MEASUREMENT. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 157, Session 15. Robert J. Ingham and R. Clark DuBois (Manning, Maxwell, and Moore, Inc., Stratford, Conn.). New York, American Institute of Chemical Engineers, 1958. 27p.

A NaK filled diaphragm seal assembly has been developed which can be used up to 1500°F to measure pressure in liquid metal systems. The pressure can be shown on an indicating gauge connected by a suitable length of capillary to the seal. Both pneumatic and electric transmitters can be provided. Units have been made of several materials and with ranges of 0 to 100 to 0 to 400 psi. Minimum material thickness used in contact with the process fluid is 0.025 in., one ply. The change in calibration for temperatures between 70 and 1400°F is approximately 1% of full scale. Extensive testing has indicated good results. (auth)

Isotopes

12533 AECU-3768

Michigan. Univ., Ann Arbor.

SUMMARY OF ALL-UNION CONFERENCE ON THE APPLICATION OF RADIOACTIVE AND STABLE RADIOISOTOPES IN THE NATIONAL ECONOMY AND SCIENCE OF THE USSR — 1957 (AEC-tr-2925 AND AEC-tr-3093). W. Wayne Meinke. July 15, 1958. 16p. Project No. 7. Contract AT(11-1)-70. $3.30(ph OTS); $2.40(mf OTS).

A total of 418 abstracts from this conference and the complete text of five plenary session papers, as well as 55 abstracts from an All-Union Conference on Radiation Chemistry, have been made available in translation in AEC-tr-2925. Almost all of these papers deal with the actual applications of tracers or radiation in the national economy. The papers presented were divided into three major sections: isotope production and high-intensity gamma systems, technical sciences and industrial uses of isotopes, and biology, medicine, and agriculture. A short summary of the papers as to groups is given. (W.D.M.)

12534 ORNL-2492

Oak Ridge National Lab., Tenn.

ISOTOPES DIVISION ANNUAL REPORT FOR 1957. H. E. Seagren. Compiled from data by: E. E. Beauchamp, J. H. Gillette, E. Lamb, and P. S. Baker. July 21, 1958. 63p. Contract W-7405-eng-26. $1.75 (OTS).

The number of radioisotope shipments made in 1957 is presented. Radioisotope development activities included adoption of a distillation process for carrier-free P^{32}, startup of the short-lived fission products operations, development of final product purification procedures and equipment for the fission product pilot plant, design and operation of a larger-capacity Kr^{85} purification cell, development of routine production of I^{130}, and rapid processing and shipment of short-lived processed radioisotopes. In the stable isotope program, ten elements have been processed by electromagnetic separation. The isotopes of erbium have been separated for the first time at ORNL. Four isotopes of dysprosium, Dy^{156}, Dy^{158}, Dy^{160}, and Dy^{164}, were placed in inventory for the first time. In the heavy-element isotope program, separations were completed to give products with 92% Pu^{240}, 62% Pu^{241}, 98% U^{234}, and 98% U^{236}. Isotope separations development activities were concentrated primarily on the design and testing of new or modified components for electromagnetic separations equipment and investigations of alternative methods of isotope separations. (W.L.H.)

12535

ENERGY LEVELS IN Bi^{207} FROM THE DECAY OF Po^{207}. E. Arbman, J. Burde, and T. R. Gerholm (Univ. of Uppsala). Arkiv Fysik 13, 501-38(1958).

The energy levels in Bi^{207} have been studied from the decay of 5.7 hr Po^{207}. The experiments include measurements of the energies and intensities of conversion electron lines and positron distributions in a double focusing spectrometer; measurements of gamma-ray spectrum in a scintillation spectrometer and to some extent in the double focusing spectrometer by the use of a lead converter; measurements of coincidences between pairs of conversion lines and between positrons and conversion lines in a double lens coincidence spectrometer, and coincidences between positrons and gamma rays in a beta-gamma coincidence spectrometer. Two positron components of maximum energies 1140 kev and 893 kev were found, establishing the total decay energy of Po^{207} as 2.906 Mev. The proposed decay scheme contains 16 excited levels, 11 of which are considered to be well established. Spins and parities for the ground state of Po^{207} and the most strongly populated excited levels in Bi^{207} are given. The decay of Po^{207} is discussed on the basis of the shell model. (auth)

12536

ALPHA-EMITTERS WITH SHORT HALF-LIFE INDUCED BY PROTONS ON HEAVY ELEMENTS. P. A. Tove (Gustaf Werner Inst. for Nuclear Chemistry, Uppsala). Arkiv Fysik 13, 549-78(1958).

Alpha-emitters with short lifetimes have been produced by pulsed bombardment in a synchrocyclotron. The energies were measured with the help of the magnetic field of the cyclotron, and the decay times with an electronic time analyzer. New data for α-emitters in the region between uranium and bismuth are given. The results from bombardment of thorium agree with previous information about the Th^{224} and Th^{223} series, and yield half lives for Th^{224} and Th^{223} of respectively 1.05 ± 0.05 sec and 0.9 ± 0.1 sec. Information about further α peaks in the 1 sec region is obtained and the possibility that these are due to the Pa^{224} and Pa^{225} decay series is discussed. The main result from irradiations of Ra is a check of previous data, yielding nuclei with half lives in the range 0.5 to 40 sec. No α emitters with lifetimes in the second region were obtained from uranium, lead, thallium, gold, and platinum targets. Bombardments of bismuth yield four new α emitters which from α systematics are assigned to Po isotopes $Po^{195-192}$. (auth)

12537

ISOTOPIC EXCHANGE REACTION BETWEEN CYCLOHEXANE AND DEUTERIUM ON EVAPORATED MOLYBDENUM FILMS. Teruo Hayakawa and Toshio Sugiura (Osaka Prefectural Univ., Sakai). Bull. Chem. Soc. Japan 31, 180-5(1958) Mar.

Isotopic exchange reaction between cyclohexane and deuterium over evaporated molybdenum films has been studied mass-spectrometrically at the temperature range 56–111°C. The present results were compared with others and summarized. Since the deuterium content in our experiments was considerably low the production of considerable amounts of highly deuterated products requires a process of multiple exchange. The present results clearly indicate that one can observe no discontinuities which separate the concentrations of $C_6H_6D_6$ and $C_6H_5D_7$. The pressure-dependence was studied for this exchange and the initial rate (k) was found to be expressed as $k \propto p(C_6H_{12})^{1.0} \cdot p(\text{deuterated hydrogen})^{-0.6}$. According to the present kinetic evidence, the rate-determining step of this exchange is probably the desorption of the cyclohexyl radicals. So far as the present experiments were concerned, it seems reasonable to consider that the deuterium isotope effect gives no significant influence upon the present exchange reaction. (auth)

12538

ISOTOPIC EXCHANGE REACTION BETWEEN CYCLOHEXANE AND DEUTERIUM ON EVAPORATED TUNGSTEN FILMS. Teruo Hayakawa and Toshio Sugiura (Osaka Prefectural Univ., Sakai). Bull. Chem. Soc. Japan 31, 186-90(1958) Mar.

Isotopic exchange reaction between cyclohexane and deuterium over evaporated tungsten films has been studied mass-spectrometrically at the temperature range 79 ~ 111°C. The production of highly deuterated products in the initial stage of this exchange requires a process of multiple exchange. Evaporated tungsten films showed, however, little tendency for multiple exchange, while evaporated molybdenum films promoted multiple exchange to a large extent. One can observe no discontinuities which separate the concentrations of $C_6H_6D_6$ and $C_6H_5D_7$. It seems reasonable to consider that marked discontinuities between $C_6H_6D_6$ and $C_6H_5D_7$ observed by Anderson and Kemball for evaporated films of rhodium and palladium must not be attributed to the characteristic chair conformation of the cyclohexane molecule. The deuterium isotope effect gives no significant influence upon the over-all reaction of this exchange. (auth)

12539

THE MECHANISM OF THE ISOTOPIC EXCHANGE REACTION BETWEEN CYCLOHEXANE AND DEUTERIUM ON EVAPORATED METAL FILMS. Teruo Hayakawa and Toshio Sugiura (Osaka Prefectural Univ., Sakai). Bull. Chem. Soc. Japan 31, 190-3(1958) Mar.

The theoretical treatments of the isotopic exchange reaction between cyclohexane and deuterium over evaporated metal films have been studied. The present results of the theoretical calculations were compared with the experimental results already obtained for evaporated films of molybdenum and tungsten. The agreements between the theoretical and the experimental values of the initial product distributions for these metal films are well maintained. The initial rate of tripping of the adsorbed radicals on evaporated films of molybdenum or tungsten at each temperature is considerably greater than that of desorption (or chemisorption) of cyclohexane. This coincides well with the experimental fact that the rate-determining step of this exchange reaction may be attributed to desorption of the adsorbed radicals. The differences between the activation energy of tripping of the adsorbed radicals and that of desorption for evaporated films of molybdenum and tungsten amount to 6.8 and 9.7 kcal/mol respectively. (auth)

12540

DEUTERIUM ISOTOPE EFFECTS IN SOME ACID-CATALYZED CYCLIZATIONS OF 2-DEUTERIO-2'-CARBOXYBIPHENYL. Donald B. Denney and Peter P. Klemchuk (Rutgers Univ., New Brunswick, N. J.). J. Am. Chem. Soc. 80, 3285-8(1958) July 5.

2-Deuterio-2'-carboxybiphenyl has been cyclized to fluorenone with sulfuric acid, polyphosphoric acid and anhydrous hydrogen fluoride. The isotope effects for these reactions have been determined. Hydrogen fluoride cyclization exhibited a k_H/k_D of 3.02, whereas the other acid-catalyzed cyclizations had isotope effects in the range 1.13–1.46. The significance of these results is discussed with respect to possible mechanisms for these substitutions. (auth)

12541

DEUTERIUM ISOTOPE EFFECTS IN SOME INTRAMOLECULAR AROMATIC SUBSTITUTIONS. Donald B. Denney and Peter P. Klemchuk (Rutgers Univ., New Brunswick, N. J.). J. Am. Chem. Soc. 80, 3289-90 (1958) July 5.

2-(2-Deuteriophenyl)-benzaldehyde (I) has been allowed to react with di-t-butyl peroxide to give fluorenone. An isotope effect, k_H/k_D, of 1.38 was observed for this reaction. 2-(2-Deuteriophenyl)-benzoyl peroxide (II) has been cyclized by heating to give the lactone of 2-carboxy-2'-hydroxybiphenyl (IIIa,b). An isotope effect of 1.32 for k_H/k_D was found for this reaction. Irradiation of 2-(2-deuteriophenyl)-phenyldiazomethane (VI) gave fluorene. The isotope effect for this cyclization was found to be 1.12. (auth)

12542

A COMPARISON OF THE RATE OF MUTAROTATION AND O^{18} EXCHANGE OF GLUCOSE. D. Rittenberg and Charles Graff (Columbia Univ., New York). J. Am. Chem. Soc. 80, 3370-2(1958) July 5.

The effect of pH on the exchange reaction between the

aldehyde oxygen of glucose and the oxygen of water has been measured. The rate is at a minimum at pH 4 and rises rapidly below pH 3 and above pH 6. (auth)

12543

GAMMA RAYS FROM THE 6.89 Mev LEVEL IN ^{10}B. R. D. Edge and D. S. Gemmell (Australian National Univ., Canberra). Proc. Phys. Soc. (London) 71, 925-31 (1958) June.

Use of a large NaI(Tl) crystal has permitted determination of the yield curves of each of the high-energy gamma rays arising from the $Be^9(p,\gamma)B^{10}$ reaction for proton energies from 220 to 440 kev. The results indicate that all but the ground state gamma rays arise from the 6.89 Mev level in B^{10}, and this confirms the postulated 20% isotopic spin impurity for this level. The ground state transitions arise from the broad 7.48 Mev level and there is some evidence for part of this gamma radiation arising from direct transitions. The 6.89 Mev level can also decay by gamma-ray emission to the 5.11 Mev level. (auth)

12544

THE NUCLEAR QUADRUPOLE COUPLING CONSTANT OF ^{23}Na IN SODIUM NITRATE. R. G. Eades, D. G. Hughes, and E. R. Andrew (University Coll. of North Wales, Bangor, Caernarvonshire, Eng.). Proc. Phys. Soc. (London) 71, 1019-20(1958) June.

The rapid fall of the quadrupole coupling constant in $Na^{23}NO_3$ from that of $Na^{23}ClO_3$ is reported and discussed. Some preliminary conclusions about this observed change in coupling constant were reached: lattice expansion can only account for part of the change; co-operative re-orientation of NO_3^- groups about their trigonal axes or co-operative disordering of the NO_3^- groups are unlikely in themselves to account for the change. (T.R.H.)

12545

ISOTOPE SHIFTS IN THE ATOMIC SPECTRUM OF PALLADIUM. H. G. Kuhn and A. G. Warner (Univ. of Oxford). Proc. Roy. Soc. (London) A245, 330-4(1958) June 24.

The isotope shifts in the arc line 3405A are measured, for all even isotopes of palladium, on enriched samples. A comparison of the shifts in palladium, cadmium, and tin points to a systematic influence of the charge number on the isotope effect. (auth)

Isotope Separation

12546

THE ELECTROLYTIC SEPARATION FACTOR OF HYDROGEN ISOTOPES ON METAL ELECTRODES. Yōichi Takashi, Shumpei Oka, and Mitsuru Oikawa (Univ. of Tokyo, Hongo). Bull. Chem. Soc. Japan 31, 220-4(1958) Mar.

The electrolytic separation factor (α) for hydrogen on Fe, Cu, Ni, Ag, Pt, Au, Pb, Hg, and Sn in 0.2N H_2SO_4 containing 0.2 at.% deuterium was measured. Time variation of α for Pt, Ni, and Cu suggests that the hydrogen evolution takes several paths. A change of the reaction process which follows the change in electrode surface conditions is indicated. (T.R.H.)

12547

ENRICHMENT OF Li^6 BY COUNTERCURRENT ELECTROMIGRATION. Ernest R. Ramirez (Univ. of Zürich). J. Phys. Chem. 62, 760-1(1958) June.

Enrichment of Li^6 was carried out in a 0.007N solution of lithium acetate by countercurrent electromigration. The results indicate that so long as the ionic isotopes are heavily hydrated, the efficiency of the separating process is seriously impeded, and it appears that when the ionic species is not attached to other molecules during the migration the separation of species can be effected. (J.R.D.)

12548

ELECTROMAGNETIC SEPARATION OF THE ISOTOPES OF THE HEAVY ELEMENTS. R. S. Livingston and J. A. Martin (Oak Ridge National Lab., Tenn.). Chapter 50 of Proc. Symposium on Isotope Separation, Amsterdam, 597-609(1957).

Special high-resolution mass spectrographs have been developed for the preparation of highly enriched isotopes of the heavy elements. These special purpose isotope separators and the techniques used in handling alpha-active materials are described. (auth)

12549

SPECIAL ISOTOPE SEPARATOR FOR IDENTIFICATION OR PURIFICATION OF RADIOACTIVE SPECIES. R. S. Livingston and J. A. Martin (Oak Ridge National Lab., Tenn.). Chapter 51 of Proc Symposium on Isotope Separation, Amsterdam, 610-14(1957).

The preliminary development of a small 180° mass spectrograph designed to operate in the framework of a standard 24-in.-radius machine is discussed. The unit requires less than one gram of feed material and provides very high resolution. The performance with heavy elements at elevated temperatures has been measured. (W.D.M.)

12550

PRESENT STATUS OF ELECTROMAGNETIC SEPARATION OF STABLE ISOTOPES AT THE OAK RIDGE NATIONAL LABORATORY. L. O. Love, W. A. Bell, Jr., W. K. Prater, G. M. Banic, and A. E. Cameron (Oak Ridge National Lab., Tenn.). Chapter 52 of Proc. Symposium on Isotope Separation, Amsterdam, 615-21(1957).

The total collection for 10 years has been 15,311 grams. Of this, 13,656 grams have been processed for chemical recovery of the separated materials, yielding 7,670 grams. An increase in output is possible by increasing the retention of the chemical processing. A summary of the isotopes separated for the last two years is presented. (W.D.M.)

12551

CONCENTRATION OF ISOTOPES C^{13} AND O^{18} IN CARBON DIOXIDE BY THERMO-DIFFUSION METHOD. G. M. Panchenkov and V. D. Moiseyev. Zhur. Fiz. Khim. 30, No. 7, 1662-7(1956). (Translated from Referat. Zhur. Khim. No. 6, 1957, Abstract No. 18415.)

The concentration of C^{13} and O^{18} isotopes in a molybdenum glass tube was studied by the thermodiffusion method. The inside radius of the tube was 0.40 cm; the top and the bottom of the tube were connected with receivers, the capacities of which were 2.5 l and 60 ml, respectively. A Pt filament (287 cm long, radius 0.015 cm) was stretched along the tube axis. CO prepared by gradual addition of HCOOH to concentrated H_2SO_4 and purified by $KMnO_4$, KOH, and concentrated H_2SO_4 was fed into the tube previously evacuated to 10^{-2}–10^{-3} mm of mercury. The Pt filament was heated to 730°. Samples were taken in glass ampules and analyzed with a mass spectrometer. At CO pressures of 750, 675, 600, 400, and 200 mm of mercury, the time before the equilibrium was reached was about 120 hours; the maximum separation factor $q = [C^{13}/C^{12}(\text{bottom})] / [C^{13}/C^{12}(\text{top})] = 2.28$ at 675 mm of mercury, and $q' = [O^{18}/O^{16}(\text{bottom})] / [O^{18}/O^{16}(\text{top})] = 2.44$ at 400 mm

of mercury. It was shown that the theory of the thermodiffusion tube was applicable to semiquantitative forecasting of results of experiments with given parameters. A convenient method of oxidation of small quantities of CO into CO_2 in a special appliance using I_2O_5 was developed.

Mass Spectrography

12552 KAPL-1843
Knolls Atomic Power Lab., Schenectady, N. Y.
A THREE-STAGE RESEARCH MASS SPECTROMETER. F. A. White, F. M. Rourke, and J. C. Sheffield. May 28, 1958. 53p. Contract W-31-109-Eng-52. $1.50(OTS).

A three-stage mass spectrometer that utilizes two consecutive magnetic focusing lenses of 20-in. radii followed by a 20-in. radius-of-curvature electrostatic analyzer is described. An abundance sensitivity of 10^{10} was measured for this instrument in the low mass region. Application of this instrument to analytical and research problems in the field of mass spectrometry and the results obtained are discussed. (auth)

12553
CURRENT STABILIZER FOR A PRECISION MASS-SPECTROMETER MAGNET. V. P. Afanas'ev (Kharkov Polytechnic Inst.). Pribory i Tekh. Eksp. No. 1, 59-62 (1958) Jan. (In Russian)

An electromagnetic current stabilizer for a precision mass spectrometer is described. The apparatus has a current range from 50 ma to 1 a. With a line voltage shift from 210 to 250 v the load current varies less than 10^{-4}%. With initial heating of 1.5 hr the drift is less than 10^{-3} %/hr. (tr-auth)

Mathematics

Refer also to abstract 12141.

12554 AECU-3760
Illinois. Univ., Urbana. Digital Computer Lab.
TECHNICAL PROGRESS REPORT. PART I. HIGH-SPEED COMPUTER PROGRAM. PART II. MATHEMATICAL METHODS. PART III. SWITCHING THEORY. PART IV. ILLIAC USE AND OPERATION—GENERAL LABORATORY INFORMATION. Apr. 1958. 33p. Contracts AT(11-1)-415; N6ori-07130; and Nonr-1834(15). $6.30(ph OTS); $3.00(mf OTS).

Investigations of transistor circuits, other circuits, and related equipment for the high-speed computer program are reported. Mathematical methods for hydrodynamic flow problems and an iterative method for linear equations are discussed. Switching theory studies are reported, and the operation and use of ILLIAC in April are summarized. (For preceding period see AECU-3756.) (T.R.H.)

12555 AECU-3761
Illinois. Univ., Urbana. Digital Computer Lab.
TECHNICAL PROGRESS REPORT. PART I. HIGH-SPEED COMPUTER PROGRAM. PART II. MATHEMATICAL METHODS. PART III. SWITCHING CIRCUIT THEORY. PART IV. ILLIAC USE AND OPERATION—GENERAL LABORATORY INFORMATION. May 1958. 24p. Contracts AT(11-1)-415; N6ori-07130; and Nonr-1834(15). $4.80(ph OTS); $2.70(mf OTS).

Work on circuits for high-speed computers, iterative methods for linear equations, hydrodynamic flow problems, and switching circuit theory are reported. The operation and use of ILLIAC for May are summarized. (For preceding period see AECU-3760.) (T.R.H.)

12556 APEX-373
General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.
THERMAL FLUX PROGRAM FOR A SLAB SYSTEM. J. R. Beeler and J. D. Popp. Feb. 1958. 16p. (XDC-58-5-84). $3.30(ph OTS); $2.40(mf OTS).

A program is described for computing a quantity, Q, proportional to the neutron scalar flux, in an infinite heterogeneous slab system. The system is generated by a two-region unit cell. Q is the average track length per unit length, in a given interval, arising from the neutron traffic established by a spatially distributed monenergetic source. The program is coded for the IBM 704 computer. (auth)

12557 MURA-360
Midwestern Universities Research Assoc., Madison, Wis.
A MANUAL FOR THE USE OF MURA IBM 704 PRODUCTION PROGRAMMES. Jess Anderson. [1958?]. 73p. $9.30(ph OTS); $3.60(mf OTS).

The technical instruments of problem preparation and calculator operation with Midwestern Universities Research Association production program are described. (T.R.H.)

12558 NP-6807
Stanford Research Inst. Poulter Labs., Menlo Park, Calif.
NODAL EXPANSIONS. I. DISTRIBUTION FUNCTIONS, POTENTIALS OF AVERAGE FORCE, AND THE KIRKWOOD SUPERPOSITION APPROXIMATION. Emmanuel Meeron. Jan. 15, 1958. 31p.

The customary density power series expansions of potentials of average force and distribution functions are converted into a new class of expansions, defined in terms of topological nodes. The physical meaning of the terms in the new expansions is discussed, and arguments are presented to show that the new expansions can be expected to converge considerably more rapidly than the customary density expansions. The probable occurrence of phase transitions is discussed. Possible further developments are suggested. The Kirkwood superposition approximation is shown to be valid for a large number of terms in the expansions of potentials of average force and distribution functions. The customary comparison of the exact value of the third virial coefficient with that obtained via the Kirkwood superposition approximation is shown to provide no proof of the validity or invalidity of the latter. (auth)

12559 SCR-22
Sandia Corp., Albuquerque, N. Mex.
GEOMETRIC PROGRESSIONS MODULO n AS RANDOM NUMBER GENERATORS. Donald R. Morrison. [Oct. 1957]. [Issued] June 1958. 11p. Contract AT-(29-1)-789. $1.80(ph OTS); $1.80(mf OTS).

Presented at organizational meeting of the Southwestern Section, Assoc. for Computing Machinery, Oct. 1957.

A geometric progression modulo n is defined, and methods are given for predicting its period. Its usefulness as a random number generator is discussed. (auth)

12560 AEC-tr-3291
METHODS FOR THE CALCULATION OF PROPERTIES OF QUATERNARY SYSTEMS FROM DATA ON BINARY SYSTEMS. S. D. Gromakov. Translated for Los Alamos Scientific Lab. from Zhur. Fiz. Khim. 30, 2621-39(1956). 21p.

Some equations are proposed for the hypersurfaces of a four-dimensional measurement (equations of the volume of a property), on the basis of which it is possible to calculate properties of quaternary systems from data on binary systems. (auth)

12561 AEC-tr-3292

TOPOANALYTICAL INVESTIGATION OF EQUILIBRIUM DIAGRAMS FOR MULTICOMPONENT EUTECTIC SYSTEMS. [PART] I. L. S. Palatnik and I. M. Kopeliovich. Translated for Los Alamos Scientific Lab. from Zhur. Fiz. Khim. 30, 1948-58(1956). 13p.

A topoanalytical method was proposed for the construction of plane-section equilibrium diagrams for ternary and quaternary systems. A topological solution of this problem was given for the case of eutectic systems. The method used in the study to derive all of the equations of the surfaces, the construction of the obtained formulas, and also the designations adopted in the study, make it possible to generalize the obtained results to systems with any number of components. (auth)

12562

A VARIABLE FUNCTION DELAY FOR ANALOG COMPUTERS. R. S. Stone and R. A. Dandl (Oak Ridge National Lab., Tenn.). IRE Trans. on Electronic Computers, 187-9(1957).

Analysis of reactor problems requires the simulation of transport lags. The design of a compact and relatively simple transport lag utilizing a synchronously switched bank of condensers is discussed. (auth)

12563

THEORY OF RADIATIVE TRANSITIONS: GENERAL FORMULAS AND APPLICATIONS TO DIFFUSION WITH RESONANCE AND TO MULTIPLE DIFFUSION (EXCITATION TRANSFERS). E. Arnous (Laboratorie di Physique de l'École Normale Supérieure and Institut Henri-Poincaré, Paris) and Y. Héno (Laboratorie de Chimie-Physique de la Faculte des Sciences, Paris). J. phys. radium 19, 443-62(1958) Apr. (In French)

An elementary method enables us to establish unambiguously, the following general and convergent expressions: the probability amplitudes for transitions involving one (or three) and two (or four) quanta, the probability amplitude for the initial state up to the fourth order in $e/\sqrt{4\pi\hbar c} = \sqrt{1/137}$, the scattering matrix up to the fourth order. These expressions are valid for large time values. The mass is renormalized. The displaced level representation is introduced and the virtual states are eliminated. The level displacement and breath matrices are grouped with the corresponding energies in order to form damping terms. Degeneracy effects are taken into account. Two applications are treated in detail: the resonance scattering and multiple scattering (excitation transfers). (auth)

12564

STUDY OF THE THERMODYNAMIC BEHAVIOR OF NUCLEAR REACTORS. G. Fournet (Société Alsacienne de Constructions Mécaniques, Paris). J. phys. radium 19, Suppl. No. 4, 39A-47A(1958) Apr. (In French)

By means of a mathematical approximation monomial expressions of different parameters governing the thermodynamical behavior of a very general type of nuclear reactor are obtained. Thus we can foresee immediately the consequences of any modification of fundamental reactor data. (auth)

12565

A METHOD FOR STUDYING CORRELATIONS IN QUANTIC FLUIDS IN EQUILIBRIUM. J. Yvon. Nuclear Phys. 4, 1-20(1957) Aug.

The first section reviews the principles of a method for studying correlations in a classical fluid in equilibrium. The following sections attempt to expand the method and to apply it to quantic fluids. The state of the system is no longer represented by wave functions but by density operators. The properties of the perfect gases are first of all coordinated with the aid of these operators. Next the problem of systems with interactions is attacked. A series of recurrent equations defines a method of successive approximations. If one is prepared to admit that, in spite of the interactions, the correlations are those of perfect gases, the formulas are identical with those of the self-consistent field. For the case of short-range forces another method is proposed. It is developed from the classical method of Ursell for obtaining the equation of state of a fluid. The results seem to point to the possibility of a kind of Bose-Einstein condensation in a system of interacting fermions. The appearance of this phenomenon is due, on the one hand, to the importance, in all dense fluids, of correlations between the particles taken in pairs, and on the other hand to the fact that a pair of fermions constitute a boson. (auth)

12566

THE SOLUTIONS OF THE LOW EQUATION. II. D. B. Fairlie and J. C. Polkinghorne (Tait Inst. of Mathematical Physics, Edinburgh). Nuovo cimento (10) 8, 555-9 (1958) May 16.

The Low equation for a non-relativistic factorizable potential is investigated. The familiar solution for h(k), where h(k) is the scattering amplitude, is obtained directly as a Low equation by proceeding from the eigenstates of the total Hamiltonian to the eigenstates of the free Hamiltonian. The relation between the manifold of solutions of the Low equation for h(k) and the spectrum of the free Hamiltonian is immediate. The zeros of h(k) are the bound state energies of the free Hamiltonian. (auth)

Measuring Instruments and Techniques

Refer also to abstract 12136.

12567 AFOSR-TN-58-497

Michigan State Univ., East Lansing.

THE USE OF A SAMARIUM LOADED LIQUID SCINTILLATOR FOR THE DETERMINATION OF THE HALF-LIFE OF Sm^{147}. G. B. Beard and W. H. Kelly. June 18, 1958. 8p. Contract AF49(638)-10. (AD-158307).

An investigation of the use of metal loaded organic liquid scintillators for the study of long lived alpha emitters was carried out. The method was checked using a samarium loaded scintillator. A specific activity corresponding to a halflife of $(1.28 \pm 0.04) \times 10^{11}$ years for the alpha decay of Sm^{147} was found. This is in agreement with the published halflife measured using a different technique. (auth)

12568 ANU/P-184

Australian National Univ. Research School of Physical Sciences, Canberra.

RESPONSE CURVES OF ALKALI HALIDE SCINTILLATORS WITH SPECIAL REFERENCE TO THE $Li^6(n,\alpha)$ REACTION IN LITHIUM IODIDE. T. R. Ophel. [1958.] 9p.

Proton and gamma-ray responses of the alkali halide scintillators, NaI, KI, CsI, LiI and Li^6I were obtained and the response of a 5-Mev proton was found to be approximately equivalent to the response of a 7-Mev electron for all five scintillators. Special emphasis was

given to the responses of LiI and Li^6I in an attempt to clarify various anomalies which arose in the course of neutron energy measurements with LiI by means of the $Li^6(n,\alpha)$ reaction. From an estimate of the triton response of LiI and Li^6I, which was derived from the proton and gamma-ray data in conjunction with the alpha-particle response and measurements of the pulse height of the $Li^6(n,\alpha)$ group, it was shown that energy calibration of the $Li^6(n,\alpha)$ group with gamma rays is unsatisfactory. (auth)

12569 CWLR-2222

Chemical Warfare Labs., Army Chemical Center, Md.

A GEIGER COUNTER FOR LARGE DIAMETER SOURCES. Leonard Bird and John Kinch. June 1958. 20p.

A Geiger-Mueller counter of the flow type with a $4\frac{3}{4}$ inch diameter window is described. The adaptation of this counter to 4π counting is discussed. It is concluded that the counter described is suitable for counting large area sources up to 4 inches in diameter and can be adapted to 4π counting. (auth)

12570 GEAP-0974

General Electric Co. Atomic Power Equipment Dept., San Jose, Calif.

THE DETERMINATION OF FISSION PRODUCT GAMMA DOSES. William G. Ruehle, Jr. Feb. 25, 1957. 59p. $9.30(ph OTS); $3.60(mf OTS).

Graphite data and formulas are presented by which the gamma dose from an irradiated fission source may be easily and accurately computed. The determination of the fission product gamma dose would appear to require consideration of the more than 200 gamma sources formed by fission. Actually, a dose, accurate to 90% or better, can be computed by considering less than twelve fission products. (auth)

12571 GPI-42

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

GAMMA RAY CRYSTAL SPECTROMETERS. J. W. Knowles. Nov. 1957. 41p.

The characteristics of curved-crystal and flat-crystal spectrometers as γ-ray measuring devices are discussed. A comparison of the two geometries shows that the curved-crystal spectrometer is more efficient than the flat-crystal device but that under suitable conditions the latter can have higher counting rates for comparable resolution. Such conditions exist for the double flat-crystal spectrometer when used to study γ rays of neutron capture from a thermal reactor. The flat-crystal spectrometer now in operation uses two 2.3 cm thick calcite crystals of 3 sec mosaic, while the existing curved-crystal spectrometers use bent quartz lamina a few millimeters thick. It is suggested that the efficiency of both types of spectrometers may be greatly improved by using crystals of high electron density. Replacing the calcite crystal in the double flat-crystal spectrometer by a 5 cm germanium crystal of comparable mosaic would improve its efficiency by more than an order of magnitude at γ-ray energies of 6 Mev. A similar improvement can be expected for the curved-crystal spectrometer. A high-efficiency curved-crystal spectrometer of 20 cm radius using a thin gold crystal, useful for γ-γ and β-γ coincidence measurements, is proposed and its characteristics outlined. (auth)

12572 HW-54553

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

AN ALPHA, BETA, GAMMA HAND AND SHOE COUNTER—MODEL II. W. G. Spear. June 2, 1958. 13p. Contract W-31-109-Eng-52. $0.50(OTS).

The combined alpha, beta, gamma hand and shoe counter uses alpha scintillation detectors and beta-gamma G. M. tube detectors. Total monitoring time per individual is 15 seconds. The alpha probe portion sensitivity is such that the instrument will indicate above warning level for a 250 d/m Pu alpha source distributed over an area eight by four inches. The beta-gamma sensitivity is the same as for the Five-Fold; approximately twice warning level for a fifty millimicrocurie uranium nitrate source distributed over a similar area. There are five register readouts: alpha left hand, beta-gamma left hand, beta-gamma shoes, beta-gamma right hand, and alpha right hand. In addition to these, two separately operated cable-connected probes are attached to the instrument. These probes are activated separately from the main instrument, and each in turn drives a loudspeaker. One probe monitors clothing and shoes for alpha contamination, and it will detect spot alpha sources with activities as low as 100 d/m. The other probe is a single 1B85 metal-wall G. M. tube with a response similar to a standard portable G. M. This probe is used to monitor clothing, etc., for possible beta-gamma contamination. While one individual is using the main hand and shoe counter, a second may be using the cable-connected probes. Except for the supply of power, the cabled probes and speaker operate independently of the main instrument, and can be used for as long a time as necessary. (auth)

12573 HW-54947(Rev.)

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

A SCINTILLATION ALPHA-BETA-GAMMA FIXED-FILTER COUNTER. M. O. Rankin and W. G. Spear. May 1, 1958. 12p. Contract W-31-109-Eng-52. $0.50(OTS).

A scintillation alpha-beta-gamma filter counter has been developed which simultaneously monitors filters for alpha and beta-gamma contamination with none of the faults of the present equipment. The instrument has two lucite light pipes, two RCA 6655 photomultiplier tubes, two scaling units, and a light-tight box with a roller bearing mounted slide for transporting the filter. The average center geometry for the alpha probe is 20 to 25 per cent with a background of approximately 2 c/m. The average center efficiency for the beta-gamma probe is 0.8 to 1.0 per cent for a 600-kev gamma source and 20 to 25 per cent for a 500-kev beta source. (auth)

12574 INSJ-10

Tokyo Univ. Inst. for Nuclear Study.

DEVELOPMENT OF DOUBLE FOCUSING BETA RAY SPECTROMETER. PART I. GENERAL PROPERTIES. PART II. TWIN SETTING MEASUREMENT OF THE WEAK HIGHER COMPONENT OF Cs^{137}. Mitsuo Sakai, Hidetsugu Ikegami, and Toshimitsu Yamazaki. May 21, 1958. 25p.

A small scale beta ray spectrometer was built, making use of the double focusing principle applied for sector-field. The fringing field was found to be easily corrected and not to be serious for conventional purposes. The gathering power of 0.5% was obtained for the resolving power of 0.7%. Since the source can be put outside the magnetic field, this type of spectrometer might serve as a powerful tool for coincidence and correlation measurements. A twin setting of two sector type double focusing beta ray spectrometers was used for measurement of the weak higher component of Cs^{137} in order to remove completely the contributions

resulting from the secondary causes. The measured spectrum agreed well with those of the previous results, which provided a reliable basis for the analyses of coupling constants in beta decay. (auth)

12575 NP-6815

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH ON GROWING OF CADMIUM SULFIDE CRYSTALS FOR DOSIMETER PURPOSES. Quarterly Report No. 4 for the Period January 17, 1958 to April 17, 1958. J. E. Powderly and K. E. Bean—W. E. Medcalf, ed. 43p. Contract DA-36-039-SC-73270. DA Project No. 3-99-00-100.

Studies were made of the growth of cadmium sulfide in alumina tubes replacing the quartz tubes previously used. The objective was to decrease the contamination of the cadmium sulfide with silica. Spectrographic analyses of the unvolatilized cadmium sulfide charge in the alumina tubes showed a much lower concentration of silicon, and the deposited cadmium sulfide single crystals also contained less silicon, although the deposition plate was polished quartz. Studies of the single crystals produced in this apparatus have not yet been sufficiently evaluated to state conclusively the effect of a lower concentration of silicon. The two crystals having the best properties from the standpoint of gamma-ray detection had a silicon concentration of 10 to 20 ppm which is less than the normal concentration. By the use of a secondary deposition plate during crystal growth the total recovery of usable crystalline cadmium sulfide was increased to 83% of theoretical. Studies of optimum seeding conditions indicated that the presence of a small amount of either zinc or silver improved the seeding characteristics of the cadmium sulfide. It was found that cadmium sulfide crystals of high resistivity ($>1 \times 10^8$ ohm-cm) gave better and more reproducible response to gamma rays when the sample was electroded parallel to the growth axis. The high resistivity portion of a crystal is usually found near the quartz deposition plate. By cutting away the cadmium sulfide of this area for a distance of 5 mm from the seed plate the crystal resistivity is reduced more than 50%. It was found that the dark quenched resistivities of cadmium sulfide crystals after remaining in the dark for several weeks were greater than the dark quenched resistivities obtained immediately after quenching with infrared. All crystals tested were of the same thickness, 2 mm. The voltage gradient applied was the same for all samples, 175 volts/cm of length. A Co^{60} field of 1 r/hour, 7 r/hour, and 10 r/hour was used in the test series. Of fourteen samples tested in the 1 r/hour field, the two crystals having the fastest rise times, namely, 1 minute and 1 minute and 10 seconds, were from different runs but contained almost identical solute impurities. The two doping agents were indium and zinc with a concentration of 0.05 to 0.1% zinc and with a concentration of 0.004 to 0.005% indium. Each of these crystals also had the fastest response to visible light with 20 milliseconds rise time for 90% saturation for the better sample. (For preceding period see NP-6716.) (auth)

12576 UCRL-8295

California. Univ., Berkeley. Radiation Lab.
WORK WITH A NOBLE GAS SCINTILLATION COUNTER (thesis). Jackson R. Pickens. May 21, 1958. 32p. Contract W-7405-eng-48. $6.30(ph OTS); $3.00(mf OTS).

Submitted to United States Naval Postgraduate School Monterey, Calif.

More than 1450 runs were made and analyzed with a noble gas scintillation counter and its associated equipment. The counter itself consists of a special photomultiplier tube looking into a scintillation chamber, and is used in conjunction with a vacuum and filling system, an output-pulse amplification system, and a 12-channel pulse-height analyzer. Because gas contamination presented a major problem, a dynamic gas-purification system was designed and effectively employed. Adequate mixing of the binary mixtures of argon and helium was a second major problem and was solved by a specially designed diaphragm pump and by close control of the flow of the constituent gases. Although the results obtained were most conclusive with pure argon and pure helium, sufficient work was completed on intermediate mixtures of these two gases to indicate that further investigation in this direction is appropriate. It is planned that future investigations will be made using xenon and krypton. (auth)

12577 AEC-tr-3279

EVALUATION OF COUNTER TUBE MEASUREMENTS. H. Pupke. Translated for Westinghouse Electric Corp. Atomic Power Div. from Arch. tech. Messen 209, 135-8 (1953). 14p.

Published in Arch. Tech. Messen 209, 135-8(1953) and previously abstracted in NSA, Vol. 7, abstract No. 6180.

12578 AERE-Lib/Trans-784

A COMPTON SPECTROMETER WITH PULSE ADDITION. V. R. Burmistrov and Yu. A. Kazanskii. Translated by P. Collins (U.K.A.E.A., Atomic Energy Research Establishment) from Pribory i Tekh. Ekspt., No. 2, 26-9(1957). 7p.

A scintillation Compton gamma spectrometer is described based on the principle of addition of the pulses corresponding to the energy of a recoil electron in the central crystal and to the energy of a scattered photon falling into the controlling crystal. Such addition of the pulses permits an increase in the effectiveness of the spectrometer over the usual Compton spectrometer, and the resolution is improved. (J.R.D.)

12579

A FLEXIBLE 20-CHANNEL TIME-DELAY AND PULSE-HEIGHT ANALYSER. EQUIPMENT FOR PULSED BOMBARDMENT STUDY OF SHORT-LIVED NUCLEI IN A CYCLOTRON. P. A. Tove (Gustaf Werner Inst. for Nuclear Chemistry, Uppsala). Arkiv Fysik 13, 579-607(1958).

A multi-channel pulse analyzer is described which is suitable for time-delay analysis of events in the range from 1 microsecond to minutes or more. Applications are lifetime measurements on isomers in this region, and with auxiliary equipment, pulsed bombardment studies of short-lived nuclei produced in an accelerator. The time sorting is done by count channels which are successively opened and shut. The analyzer is easily converted to a pulse-height analyzer. (auth)

12580

MAGNETIC ENERGY ANALYSIS OF HIGH ENERGY PARTICLES. H. Tyren and Th. A. J. Maris (Gustaf Werner Inst. for Nuclear Chemistry, Uppsala). Arkiv Fysik 13, 609-18(1958).

The experimental arrangement for measurements of 185-120 Mev protons with a magnetic spectrometer is described. (auth)

12581

CALIBRATION OF LUMINESCENT AND OF SOME OTHER DOSIMETERS IN RADS. Ye. A. Liberman. Biofizika 1, No. 6, 575-9(1956). (Translated from Referat. Zhur. Khim. No. 9, 1957, Abstract No. 31159.)

A description is given of a method for the calibration

of dosimeters which is based on the total absorption of a beam of ionizing particles of known energy in the substance of the detector and subsequent calculation of the mean absorbed dosage. In the case of luminescent detectors and low-penetration radiation, it is recommended that the measurement of the mean absorbed dosage be carried out by the difference method, i.e., from the change in the reading of the dosimeter after a layer of the substance under study has been placed between the dosimeter and the plane emitter. A dosimeter for beta radiation is described which has a plastic luminophor designed for energy values of 0.1 to 2 Mev at mean absorbed dosages not above 10^4 rad/hr.

12582

AUTOMATIC UNIT FOR DETERMINATION OF RADIOACTIVITY OF PREPARATIONS. V. A. Shirshov. Biofizika 1, No. 6, 580–4(1956). (Translated from Referat. Zhur. Khim. No. 9, 1957, Abstract No. 31155.)

The unit consists of a supply-chamber column, into which the samples are charged, a rotatable stage for moving the samples to the operation port of the T-25-BFL end-window counter, a device for dropping the samples from the stage on completion of the determination, electronic time relay assembly, and a recording mechanism. The unit is designed for a single charge of 40 samples, held in closed celluloid cups of cylindrical shape. The unit is provided with a type PS-64 recording assembly with automatic switching of scaling to 4 during measurement of background and to 64 during measurements of the activity of samples. Measurement time is set to 3 to 5 to 10 minutes. The unit can be used for a continuous determination and recording of the activity of materials for 5 days without tape recharging.

12583

A SINGLE ION DETECTOR FOR MEASUREMENT OF γ-RAY IONIZATION IN CAVITIES. J. A. Auxier, G. S. Hurst, and R. E. Zedler (Oak Ridge National Lab., Tenn.). Health Phys. 1, 21-6(1958) June.

A new method of measuring the energy absorbed in a medium due to γ-ray irradiation is described. The method requires that a counting device have linear dimensions which are small compared to the mean free path for ionization of the counting gas by the secondary electrons. Under this condition the number of ionizing events in the counter is proportional to the energy absorbed in the gas; thus the energy absorbed in the surrounding wall may be inferred from the count rate by means of the Bragg–Gray principle. Application of the method is made to a tissue dosimeter which is capable of measuring the dose due to γ-rays even when mixed with fast neutrons. (auth)

12584

SPECTRAL DISTRIBUTION OF ELECTRON FLUX IN A BETA-RADIOACTIVE MEDIUM. R. D. Birkhoff, H. H. Hubbell, Jr., J. S. Cheka, and R. H. Ritchie (Oak Ridge National Lab., Tenn.). Health Phys. 1, 27-33 (1958) June.

Beta rays from a sample of P^{32} uniformly dispersed in a bakelite medium of size larger than the beta range produce secondary electrons as they slow down. The total flux including both primary and secondary electrons may be calculated from the Spencer–Fano–Attix theory and may be compared with the flux emerging from a channel into a vacuum cavity in the medium. Measurements made with a magnetic spectrometer show good agreement with the theory in the energy region above 0.35 Mev. Slight disagreement in the region 0.05 to 0.35 Mev is not considered serious because of approximations made to the exact theory and because of loss of spectrometer transmission at these lower energies. (auth)

12585

DOSIMETRY WITH IONIZATION CHAMBERS EMPLOYING INTERNAL GAS MULTIPLICATION. Harald H. Rossi and M. Lubert (Columbia Univ., New York). Health Phys. 1, 46-50(1958) June.

In shallow ionization chambers, current densities in the range from 10^{-12} to 10^{-15} A/cm^2 may be increased by factors in excess of 10^4 by the application of high potentials. Reproduction is adequate provided regulated voltage sources are used and gas purity is maintained. The multiplication was found to be independent of current density. The method should be of value in the field of radiation protection, where it would lend itself particularly well to the accurate measurement of beta ray doses. (auth)

12586

CALCULATION OF RADIATION DOSE. W. S. Snyder (Oak Ridge National Lab., Tenn.). Health Phys. 1, 51-5(1958) June.

This paper considers the influence of phantom geometry on the dose, particularly the maximum dose, within the phantom. It is shown that the maximum dose within an irradiated convex phantom cannot exceed the maximum dose in a slab similarly irradiated and thus maximum doses computed for slabs supply upper estimates of doses for many phantoms. The first collision dose, i.e. the dose delivered in a volume element by those first interactions of the radiation which occur in the volume element, supplies an under-estimate. For radiations such that the energy released may be considered as locally absorbed, these two estimates are suprisingly close, e.g. for neutrons above 1 Mev and in 30 cm slabs, the difference is about 20 to 30%. (auth)

12587

STANDARDS AND STANDARD METHODS OF MEASUREMENT OF IONIZING RADIATIONS. K. K. Aglintsev. Izmeritelnaya Tekh. No. 4, 21-4(1956). (Translated from Referat. Zhur. Khim. No. 9, 1957, Abstract No. 31157.)

The problems relating to standard measurements of activity and dosage are considered. The possibility of providing a standard corresponding to a Curie unit (by means of Pu^{239}) is shown, whereas an exact reproduction of a roentgen by means of a standard emitter is not possible. The procedures for transfer of the correct value of magnitude of measuring unit from standard or standard setting to sample and working measures are also considered for different kinds of radiation.

12588

EFFECT OF TEMPERATURE ON THE EFFICIENCY OF SCINTILLATION COUNTERS. A. Meessen (l'Université de Louvain). J. phys. radium 19, 437-42 (1958) Apr. (In French)

The temperature effect of the scintillator is interpreted for NaI:Tl by lattice emission at low temperature, and by a shift of the Tl-center emission band at 20°C and at 100°C. The variation of the photocathode sensitivity reduces to a shift of the spectral response curve towards the red for lower temperature, at which the dynode-multiplication would be increased. This is interpreted by a surface-photoelectric effect for red light and a volume effect in secondary electron emission and blue light photo-electron emission. (auth)

12589

CALIBRATION OF A CHRONOTRON WITH THE AID OF A PULSE GENERATOR OF THE ROSENBLUM TYPE. J. Duclos and J. Fleury (Université de Grenoble).

J. phys. radium 19, Suppl. No. 4, 48A-50A(1958) Apr. (In French)

A fast neutron spectrometer using the time of flight method is described. The coincidence system is a distribution device of 6BN6 tubes. Resolving time has been improved by differential amplifiers. To test this device, a pulse generator of rise time 2×10^{-9} sec and with an amplitude from 1 to 45 V has been constructed from a Rosenblum Counter. The chronotron resolving time determined with this pulse generator has been found equal to 5×10^{-10} sec. (auth)

12590

SCINTILLATION COUNTER FOR MEASURING RADIOACTIVITY OF VAPOURS. A. E. Lowe and D. Moore (Hammersmith Hospital, London). Nature 182, 133-4 (1958) July 12.

An instrument is described which counts the carbon-14 content of vapors emerging from a gas chromatographic apparatus paralled with the analytical chromatographic record. The chromatographic vapors are condensed into a circulating liquid phosphor, a solution of diphenyl oxazole in xylene. The scintillations excited in the phosphor by the carbon-14 are detected with a photomultiplier. A schematic sketch of the instrument is included. (C.H.)

12591

MINIATURE FISSION CHAMBER. J. B. Trice (Oak Ridge National Lab., Tenn.). Nucleonics 16, No. 7, 84, 86-7(1958) July.

The design, calibration, and applications of a miniature fission chamber probe are described. The probe is a 15-ft cylinder, 3/4 in. in diameter. The fission chamber proper is at the tip of the probe. The detection accuracy is 98 ± 1.8%. (J.S.R.)

12592

SINGLE-CHANNEL COUNTER FOR CARBON-14 AND TRITIUM. T. S. Hodgson, B. E. Gordon, and M. E. Ackerman (Shell Oil Co., Martinez, Calif.). Nucleonics 16, No. 7, 89-94(1958) July.

The design and characteristics of an economical room-temperature liquid-scintillation counter that is capable of counting C^{14} activities of 10 cpm above background is presented. Careful photomultiplier selection also provides adequate efficiency and stability for tritium assay. (J.S.R.)

12593

TRANSISTORIZED, PORTABLE SPARK COUNTER. E. Laisk (New South Wales Univ. of Tech., Kensington, Australia). Nucleonics 16, No. 7, 95-7(1958) July.

A description is given of a portable, pocket-sized spark counter with visual and aural indication designed to drive a rate meter, scaler, or stroboflash. Interchangeable counting heads include a special head for detecting neutrons and a sealed extension head for underwater counting. (J.S.R.)

12594

THE USE OF THE NEON FLASH-TUBE FOR THE PRECISE LOCATION OF PARTICLE TRAJECTORIES. F. Ashton, S. Kisdnasamy, and A. W. Wolfendale (Univ. of Durham, Eng.). Nuovo cimento (10) 8, 615-21(1958) May 16.

The passage of fast cosmic-ray particles through an array of neon flash tubes has been studied, and the accuracy of location of the particle trajectories has been found to be as high as in conventional cloud chambers. (auth)

12595

MAGNETIC ANALYZER FOR STUDIES OF NUCLEAR REACTIONS. G. F. Timushev (Moscow State Univ.). Pribory i Tekh. Ekspt. No. 1, 22-30(1958) Jan. (In Russian)

The theory and scheme of a magnetic analyzer with double focusing and semicircular pole tip used in the investigation of nuclear reactions are given. The basic parameters of the analyzer are given: the mean radius of the pole tip is 50 cm, the relative solid angle is 3.1×10^{-4}, the maximum field in the clearance is 12 kev, the resolving power is 0.1% with source and detection aperture of 1×30 mm^2. The total weight of the analyzer is 4 tons. (tr-auth)

12596

LIQUID HYDROGEN BUBBLE CHAMBER. V. Z. Kolganov, A. V. Lebedev, S. Ya. Nikitin, and V. T. Smolyankin. Pribory i Tekh. Ekspt. No. 1, 31-4(1958) Jan. (In Russian)

A one-liter 10-cm capacity liquid hydrogen bubble chamber is described. A method is offered for secure vacuum tightening of glass windows with the chamber frame at low temperatures. Pictures of particle tracks obtained in a neutron beam of a synchrocyclotron are shown. (tr-auth)

12597

A LARGE BUBBLE FREON CHAMBER. G. A. Blinov, M. F. Lomanov, et al. Pribory i Tekh. Ekspt. No. 1, 35-8(1958) Jan. (In Russian)

The design and performance of a 17-liter bubble chamber using freon at room temperature and 38 atm. pressure are described. The chamber operates with an accelerator and can be applied to the observation of cosmic radiation particle tracks. A mixture of freon-12 and freon-13 with a density of 1.2 is used as the working fluid. (tr-auth)

12598

PHOTOGRAPHIC SYSTEM FOR LARGE HYDROGEN BUBBLE CHAMBERS. A. V. Belonogov, A. G. Zel'dovich, et al. Pribory i Tekh. Ekspt. No. 1, 38-41 (1958) Jan. (In Russian)

A method is described for lighting and photographing the tracks from one direction in a chamber. The method is checked with an active 10-cm hydrogen chamber. Calculations of a light scattering diagram made with the bubble in the fluid are included. (tr-auth)

12599

INCREASING THE STABILITY OF RADIATION RECORDING BY A SCINTILLATION COUNTER. Yu. P. Betin. Pribory i Tekh. Ekspt. No. 1, 43-7(1956). (Translated from Referat. Zhur. Khim. No. 9, 1957, Abstract No. 31160.)

A device is proposed which compensates, automatically, the change in amplification factor of a photomultiplier by changing subsequent amplification of impulses. The equipment consists of a scintillation counter, cathode follower, first amplifier with controlled amplification factor, a second (linear) amplifier, amplitude descriminator, scaler, and automatic regulator. Impulses of linear amplifier output reach the automatic regulator (which operates according to the principle of a peak-reading voltmeter) which controls both the amplification factor of the first amplifier and the actuation threshold of the descriminator. The device described compensates satisfactorily supply voltage change and the effect of photomultiplier fatigue at loads of less than 100 impulses per second.

12600

APPARATUS FOR MEASURING GAP DISTANCES IN PARTICLE TRACKS IN PHOTOEMULSION. A. P. Zhdanov, M. I. Kolpakov, et al. (Radium Inst.,

Academy of Sciences, USSR). Pribory i Tekh. Ekspt. No. 1, 46-7(1958) Jan. (In Russian)

12601

STABLE MULTICHANNEL POSITIVE PION DETECTOR. William Imhof, Ralph Kalibjian, and Victor Perez-Mendez (Univ. of California, Berkeley). Rev. Sci. Instr. 29, 476-9(1958) June.

A π-μ decay counter has been designed and used to count positive pions in several synchrotron and cyclotron experiments. Utilizing an improved gate generator and coincidence circuit, the detector possesses a very stable efficiency for counting pions in several energy intervals. The detector is readily adaptable to the addition of extra counters to permit the detection of pions in the presence of large backgrounds. (auth)

12602

TEFLON SHEET AS A LARGE-AREA GAS SEAL FOR GAS FLOW RADIOACTIVITY COUNTERS. K. A. Bargh (Dept. of Scientific and Industrial Research, Lower Hutt, New Zealand). Rev. Sci. Instr. 29, 536-7(1958) June.

In the design of a flow counter and sample-changing system to count alpha particles from natural rock samples in powdered form, it was necessary to provide a flexible sealing material to confine the flow of the counting gas. For this purpose a plastic foam sheet covered with a 0.006 in. layer of Teflon self-adhesive sheet was found very suitable. (W.D.M.)

12603

NEUTRON DETECTORS FOR HIGH TEMPERATURE APPLICATIONS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 123, Session 15. Edith B. Fehr (General Electric Co.). New York, American Institute of Chemical Engineers, 1958. 11p.

Neutron detectors have been developed for use in control and measurement of a critical assembly at temperatures up to 300°C. At this temperature the available coaxial low noise and high voltage cables are at the limit of their usefulness even for intermittent operation. Thus, further development in the field of high-temperature insulation meeting the very exacting requirements of this application is a prerequisite for operation of chambers and counters at higher temperatures. The instruments discussed for neutron detection are proportional counters and ionization counters. (A.C.)

12604

THEORETICAL CALCULATIONS OF THE GAMMA RADIATION SPECTRUM FROM INITIAL AND FALL-OUT RADIATIONS OF NUCLEAR WEAPONS. D. C. Borg (Brookhaven National Lab., Upton, N. Y.). pp. 39-64 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

A theoretical method was developed for describing the propagation of gamma rays in various media, and numerical solutions were carried out to the point where total dose and π-volume gamma spectral calculations can be made. Further computer calculations could furnish spectral information as a function of angular distribution for application in shielding studies. The method was normalized to weapons parameters for the case of initial bomb gamma radiation, and resultant dose-versus-distance predictions generally fit in well with observed field data. Applications in calculating the gamma spectra from fall-out showed compatibility of the calculated data with available field data. (C.H.)

Mesons

Refer also to abstracts 12837 and 12838.

12605 NP-6794

Polish Academy of Sciences. Inst. of Nuclear Research, Warsaw.

TWO EVENTS OF MESONIC HYPERFRAGMENTS DECAY IN FLIGHT. Report No. 24/VI. A. Filipkowski, E. Skrzypezak, A. Somogyi, and A. Wróblewski. May 1958. 6p.

In a systematic scanning of a part of a stack of Ilford G5 emulsions, exposed to a 300 Mev/c K^- beam from the Berkeley bevatron, 553 stars produced in interactions at rest of K^- mesons with emulsion nuclei were found. From this sample 6 certain mesonic decays of hyperfragments and 17 events which were considered as possible nonmesonic decays were established. In the latter case, however, the possibility of π^- or Σ^- stars cannot be excluded. Two of the mesonic decays of hyperfragments appeared to be decays in flight. (A.C.)

12606

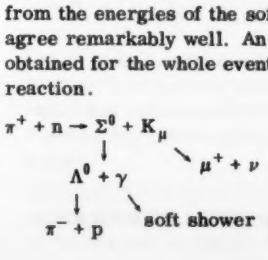
THE ENERGY DEPENDENCE OF MESON MULTIPLICITY IN THE HIGH-ENERGY INTERACTIONS. S. Kaneko (Osaka City Univ.) and M. Okazaki (Shimane Univ., Matsue, Japan). Nuovo cimento (10) 8, 521-32 (1958) May 16.

An attempt was made to analyze some experimental data of high-energy showers so far reported. It is shown that the dependence of the meson multiplicity on the primary energy seems to be explained phenomenologically, at least within the present limitation of experimental accuracy, in terms of the single nucleon-nucleon collision by making allowance for the fluctuation in inelasticity. The result seems to be consistent with the assumption that the average energy of produced mesons in the center-of-mass system is fairly constant (about 200-Mev kinetic energy) independently of the primary energy at least up to about 100 Bev so that the meson multiplicity normalized at the value 1 of inelasticity increases rather sharply with the primary energy. At higher energies, the collimation of high-energy mesons into the forward and backward cones would result in increasing the average meson energy so that the increase of the normalized multiplicity with the primary energy seems to become slower than at lower energies. The results of the analysis are discussed in comparison with the existing theories of multiple meson production. (auth)

12607

ASSOCIATED PRODUCTION OF Σ^0 AND $K^+_{\mu 2}$. M. S. Sinha and C. R. Mallik (Bose Inst., Calcutta). Nuovo cimento (10) 8, 549-54(1958) May 16.

A direct evidence for the associated production of a Σ^0 along with a $K^+_{\mu 2}$ has been obtained. The most interesting feature of the picture is that, besides showing the decays of a $\Lambda^0(\rightarrow \pi^- + p)$ and $K^+_\mu(\rightarrow \mu^+ + \nu)$, it shows the materialization of the photon resulting from $\Sigma^0 \rightarrow \Lambda^0 + \gamma$. The values of the energy of the emitted photon as derived from the decay dynamics and also from the energies of the soft electrons produced by it agree remarkably well. An over-all energy balance is obtained for the whole event which is represented by the reaction.



12608

PHOTOPRODUCTION OF π^--MESONS NEAR THRESHOLD AND THE VALUE OF THE PANOFSKY RATIO. A. Baldin (Physical Inst. of the USSR Academy of Sciences and Univ. of Birmingham, Eng.). Nuovo cimento (10) 8, 569-83(1958) May 16.

An examination of the cross sections for the reactions $\gamma + d \rightarrow \begin{cases} 2n + \pi^+ \\ 2p + \pi^- \end{cases}$ near threshold was performed. The comparison of the results of this examination with experiment is presented, and it is shown that the negative-to-positive ratio is constant in the photon energy range 153 to 193 Mev and equal to 1.4 in agreement with field theoretic results. The disagreement of these results with the values of the Panofsky ratio and the S-wave scattering phase shifts is discussed from the point of view of the two-component π^0-meson field hypothesis. A direct experimental test of this hypothesis is proposed. (auth)

12609

ON THE Σ^- CAPTURE AND THE Λ-NUCLEON CROSS-SECTION. N. N. Biswas and M. Ceccarelli (Univ. of Bologna). Nuovo cimento (10) 8, 599-606(1958) May 16.

An interpretation of the data on the capture of Σ^- particles by nuclei of photoemulsion has been attempted on the basis of the independent particle model. In particular it has been found that the probability of the Λ particle produced in the capture to remain trapped in the nucleus, and hence the average size of the Σ^- capture star, strongly depends on the mean free path of Λ particles in nuclear matter. In order to justify the experimental data the Λ-N elastic cross section at energies around 50 Mev should be about 15 mb. (auth)

12610

PION MULTIPLICITY IN ANTINUCLEON ANNIHILATION. E. Eberle (Centro Siciliano di Fisica Nucleare, Catania, Italy). Nuovo cimento (10) 8, 610-14(1958) May 16.

Pion multiplicity in antinucleon annihilation has been calculated using Dyson's hypothesis of pion-pion resonance interaction. The percentage of K mesons was also evaluated supposing that their volume of interaction has a radius given by the Compton wavelength of K mesons. Results are in reasonable agreement with experimental data. (auth)

12611

FORM FACTOR OF THE PHOTOPION MATRIX ELEMENT AT RESONANCE. W. K. H. Panofsky and E. A. Allton (Stanford Univ., Calif.). Phys. Rev. 110, 1155-65 (1958) June 1.

The inelastic scattering of electrons in hydrogen leading to pion formation has been examined. Measurements were carried out in which a hydrogen target was bombarded by electrons of energy E_1 with secondary electrons of energy E_2 being detected by a magnetic analyzer at a fixed angle of 75°. The energies E_1 and E_2 were programmed together such that the pions were produced at a constant energy near the peak of the pion-nucleon resonance in the $(3/2,3/2)$ state; at the same time the momentum transfer to the pion-nucleon system was varied. Special procedures were developed to eliminate contributions from competing processes. Approximately three fourths of the observed cross section corresponds to magnetic-dipole absorption of the incident virtual photon; the momentum transfer dependence can be interpreted in terms of a form factor of the difference between the magnetic moments of the neutron and proton. If the electron-scattering radii are assumed for the proton, then the data appear to require an rms radius of the magnetic moment of the neutron of about 1.1×10^{-13} cm, based on an exponential model; nucleon recoil corrections are still somewhat uncertain. (auth)

12612

DECAY OF THE Pi MESON. M. L. Goldberger and S. B. Treiman (Princeton Univ., N. J.). Phys. Rev. 110, 1178-84(1958) June 1.

A quantitative study of $\pi \rightarrow \mu + \nu$ decay is presented using the techniques of dispersion theory. The discussion is based on a model in which the decay occurs through pion disintegration into a nucleon-antinucleon pair, the latter annihilating via a Fermi interaction to produce the leptons. The weak vertex contains effectively both axial vector and pseudoscalar couplings even if one adopts the point of view of a universal axial vector and vector Fermi interaction. The pion-nucleon vertex which enters our model is also calculated using dispersion techniques. Under the assumption that this vertex is damped for large momentum transfers, we obtain a result for the pion lifetime largely independent of the detailed properties of the vertex and one which is in very close agreement with experiment. The precise prediction of theory depends on the energy dependence of the complex phase shift for nucleon-antinucleon scattering in the $^1S_0$ isotopic triplet state. (auth)

12613

HIGH-ENERGY PHOTOPRODUCTION OF π^0 MESONS FROM HYDROGEN. J. W. DeWire, H. E. Jackson, and Raphael Littauer (Cornell Univ., Ithaca, N. Y.). Phys. Rev. 110, 1208-9(1958) June 1.

Bremsstrahlung from the Cornell electron synchrotron passed through a liquid hydrogen target and was monitored in a quantometer. The end-point energy was set in each case sufficiently above the maximum energy being studied so that the detailed shape of the spectra was unimportant. Protons were counted in a range telescope of six scintillators with copper absorbers. Subsidiary experiments showed that only protons were counted in the telescope and that the kinematics of the reaction agreed with those expected. (A.C.)

12614

PHOTOPRODUCTION OF π^0 MESONS FROM HYDROGEN AT 500-900 Mev. P. C. Stein and K. C. Rogers (Cornell Univ., Ithaca, N. Y.). Phys. Rev. 110, 1209-11 (1958) June 1.

The photoproduction of single π^0 mesons from hydrogen has been studied using the bremsstrahlung beam of the 1.5-Bev Cornell electron synchrotron. Differential cross sections were measured at several angles in the center-of-mass system and photon energies in the range 500 to 900 Mev. The process was identified by counting the recoil protons. Since the reaction is a two-body one, an identification of the recoil proton energy and lab angle suffices to fix the meson center-of-mass angle and the incident photon energy. (A.C.)

12615

PHOTOPRODUCTION OF π^+ MESONS FROM HYDROGEN IN THE REGION 350-900 Mev. M. Heinberg, W. M. McClelland, F. Turkot, W. M. Woodward, R. R. Wilson, and D. M. Zipoy (Cornell Univ., Ithaca, N. Y.). Phys. Rev. 110, 1211-12(1958) June 1.

Positive mesons produced in a liquid hydrogen target by the bremsstrahlung beam of the Cornell 1.5-Bev synchrotron are first momentum-analyzed by a strong-focusing magnet and then identified by pulse-height and range requirements in a four-counter telescope. Single-meson production was ensured by keeping the peak energy of the bremsstrahlung spectrum below the thresh-

old for multiple production for any given angle and momentum. The results are shown graphically. (A.C.)

12616

PHOTOPRODUCTION OF K^+ PARTICLES IN HYDROGEN AT FORWARD ANGLES. H. M. Brody, A. M. Wetherell, and R. L. Walker (California Inst. of Tech., Pasadena). Phys. Rev. 110, 1213-14(1958) June 1.

The method of Donoho and Walker (Phys. Rev. 107, 1198(1957)) for measuring K-particle production in hydrogen has been improved in order to provide a clearer identification of the K particles and to allow measurements at a more forward angle, 10° in the lab system. A detection efficiency of 5% was estimated for K particles with $\beta = 0.7$. This will be tested experimentally in the future. (A.C.)

12617

BETA DECAY OF THE PION. J. C. Taylor (Imperial Coll. of Science and Tech., London). Phys. Rev. 110, 1216(1958) June 1.

12618

OBSERVATION OF UNPOLARIZED Λ's PRODUCED BY 1.5-Bev π^- INTERACTIONS IN Pb, Fe, AND C. Theodore Bowen, Judson Hardy, Jr., George T. Reynolds, Guido Tagliaferri, and Albert E. Werbrouck (Princeton Univ., N. J.), and William H. Moore (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. Letters 1, 11-12(1958) July 1.

Bubble chamber observations have shown an "up-down" asymmetry in the decay of Λ's produced by the reaction $\pi^- + p \rightarrow \Lambda + \theta^\circ$. A search for asymmetries among 138 Λ events produced by interactions of 1.5-Bev π^- mesons in lead, iron, and carbon is reported. (L.T.W.)

12619

PHOTOPRODUCTION OF POSITIVE PIONS FROM PHOTONS. Jack L. Uretsky, Robert W. Kenney, Edward A. Knapp, and Victor Perez-Mendez (Univ. of California, Berkeley). Phys. Rev. Letters 1, 12-14(1958) July 1.

The results of the experimental determination of the differential cross sections for the reaction $\gamma + p \rightarrow \pi^+ + n$ at 260 and 290 Mev are given. The theoretical cross sections were calculated from dispersion relation formulas and compared to the experimental values. It is concluded that the photoproduction cross section is a very sensitive function of the pion-nucleon scattering phase shifts. (L.T.W.)

12620

SEARCH FOR A LONG-LIVED CHARGED PARTICLE. P. C. Stein (Cornell Univ., Ithaca, N. Y.). Phys. Rev. Letters 1, 21(1958) July 1.

A search was made for particles with a mass of $500m_e$, using the γ-ray beam of the Cornell electron synchrotron. In runs with a beam of 2×10^{11} equivalent quanta, 510 counts were observed with the Be target in, and 400 counts were observed with the target out. If the mass of the particle is assumed to be $500m_e$, the particle is assumed to be produced in pairs, and the lifetime is assumed to be 150 μsec, an average upper limit to the cross section from 550 to 1100 Mev of 4×10^{-33} cm^2/nucleon can be set. (M.H.R.)

12621

DIVERGENCELESS CURRENTS AND K-MESON DECAY. S. Weinberg (Columbia Univ., New York), R. E. Marshak and S. Okubo (Univ. of Rochester, N. Y.), E. C. G. Sudarshan (Harvard Univ., Cambridge, Mass.), and W. B. Teutsch (Tufts Univ., Medford, Mass.). Phys. Rev. Letters 1, 25-7(1958) July 1.

It is pointed out that one may test the role of divergenceless currents in strangeness nonconserving $(\mu\nu)$ interactions by looking for certain striking effects in the angular correlations in $K_{\mu 3}$ decay. It is assumed that only positive chiral states are coupled. A unique formula for the angular distribution is obtained which reverses the former expectations. Predictions are made from this. (M.H.R.)

12622

PROTONIC Σ-DECAY WITH AN ASSOCIATED ELECTRON PAIR. A. G. Ekspong and S. Nilsson (Inst. of Physics, Uppsala). Phys. Rev. Letters 1, 36-8(1958) July 1.

In the "protonic" decay of the Σ^+ hyperon, a proton with unique momentum is emitted. The neutral particle is assumed to be a pion. A decay of a Σ hyperon into a proton and an associated electron pair was observed in G5 emulsion stack. Various explanations of the event are listed. The explanation of the event as involving a Dalitz decay of the π^0 followed by a bremsstrahlung energy loss of one of the electrons seems to be least improbable. (M.H.R.)

12623

PRECISE MEASUREMENTS OF MUON MAGNETIC MOMENTS BY "STROBOSCOPIC COINCIDENCES." R. A. Lundy, J. C. Sens, R. A. Swanson, V. L. Telegdi, and D. D. Yovanovitch (Univ. of Chicago). Phys. Rev. Letters 1, 38-40(1958) July 1.

The recently proposed technique of "stroboscopic coincidences" was applied successfully to the measurement of the magnetic moments of positive and negative muons. These measurements were performed in magnetic fields of ~300 gauss and ~3700 gauss corresponding to muon precession frequencies of about 4 and 48 Mc/sec, respectively. Only the experimental technique used at 48 Mc/sec is described. Plots of stroboscopic coincidences obtained with μ^+ and μ^- are given. (M.H.R.)

12624

CROSS SECTION FOR THE TRANSFER OF A MUON FROM A PROTON TO A DEUTERON. S. S. Gershtein. Soviet Phys. (Doklady) 2, 559-62(1957) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 6743.

12625

PHOTOPRODUCTION OF STRANGE PARTICLES. S. G. Matinyan (Inst. of Physics, Academy of Sciences, Georgian SSR). Soviet Phys. JETP 6, 819-20(1958) Apr.

The photoproduction of strange particles is considered phenomenologically. It is shown that the photoproduction of strange particles on nucleons may serve as a verification of Peaslee's (Phys. Rev. 105, 1034 (1957)) statistical model of the production of strange particles. (J.S.R.)

Meteorology

Refer also to abstract 12195.

12626 ANL-5869

Robert A. Taft Sanitary Engineering Center, Cincinnati; and Argonne National Lab., Lemont, Ill.

REPORT ON MEETING OF AD HOC COMMITTEE ON SCALING MESOMETEOROLOGICAL PHENOMENA HELD AT ARGONNE NATIONAL LABORATORY,

MAY 15-17, 1957. R. C. Wanta and H. Moses, eds. June 1958. 26p. Contract W-31-109-eng-38. $0.75 (OTS).

The problems and difficulties involved in scaling and modeling terrain for mesometeorological studies are discussed. (T.R.H.)

12627 NRL-5143

Naval Research Lab., Washington, D. C.

FURTHER STUDIES ON THE CORRELATION OF BACKSCATTERING WITH ATMOSPHERIC TRANSMISSION. J. A. Curcio, G. L. Knestrick, and T. H. Cosden. Apr. 4, 1958. 21p.

The correlation of backscattered light with meteorological range at 6650 A has been investigated for a variety of atmospheric conditions free of industrial pollution, in which the meteorological range varied from less than 0.10 mile to more than 40 miles. The data show the existence of a good correlation between meteorological range and backscattered light in air free of industrial contaminants. (J.R.D.)

12628 SCR-27

Sandia Corp., Albuquerque, N. Mex.

EMPIRICAL UNCERTAINTIES IN PREDICTING PARTICLE TRAJECTORIES. T. E. Van Zandt and J. W. Reed. [Sept. 1956]. [Issued] June 1958. 15p. Contract AT(29-1)-789. $3.30(ph OTS); $2.40(mf OTS).

Presented at Meeting of the American Meteorological Society Albuquerque, N. Mex. Sept. 1956.

Project Rawijet, conducted by Sandia Corporation and the Air Weather Service, provided detailed observations of time and space variability of rawinsonde runs. Sequences of these balloon runs have been examined to determine the uncertainty of predicting the ground trajectory of airborne parcels or particles. A separation of the two contributing variables, time of flight and the length of time over which persistence is forecast, has been attempted. The relation of the results to existing turbulence theory is discussed. (auth)

12629 SCL-T-189

ROCKET INVESTIGATION OF THE ATMOSPHERE (Raketnye Issledovania Atmosfery). P. P. Alekseev, E. A. Besyadovskii, G. I. Golyshev, M. N. Izakov, A. M. Kasatkin, G. A. Kokin, N. S. Livshits, N. D. Masanova, and E. G. Shvidkovskii. Translated by M. I. Weinreich, Sandia Corp. from Met. I. Gidrol. No. 8, 3-13(1957). 19p.

The applicability of rockets to meteorology is discussed. A meteorological rocket and its instrumentation, operation, take-off, flight, and recovery are described. Some calculations which must be applied to the data from such a rocket are shown. (T.R.H.)

Molecular Properties

12630

AN ELECTROSTATIC MODEL FOR PREDICTION OF SHAPES OF COVALENT MOLECULES AND IONS. Alan W. Searcy (Univ. of California, Berkeley). J. Chem. Phys. 28, 1237-42(1958) June.

For covalently bonded molecules and ions containing a central atom and one or more lone electron pairs, oxygen atoms, or sulfur atoms, bond angles can be predicted to within a few degrees by means of an electrostatic model. The parameters required are in electrostatic repulsion number (ERN) for each substituent atom. These ERN's (except for that of fluorine) depend only on the chemical family of the substituent atom and on the period of the central atom. The model emphasizes the strong influence of lone pair electrons on molecular shapes, dipole moments, and other chemical and physical properties. (auth)

12631

SUPERCONDUCTIVITY OF THORIUM BELOW 1°K. Norman M. Wolcott and Robert A. Hein (U. S. Naval Research Lab., Washington). Phil. Mag. (8) 3, 591-6 (1958) June.

The critical magnetic field of thorium has been determined between 0.1 and 1.37°K, the transition temperature, where the initial slope of the critical field curve is 190 gauss/deg. The data indicate a value of 162 gauss for the critical field at absolute zero. The critical field curve departs from a parabola near the transition temperature. The electronic specific heat, 11.1×10^{-4}T cal/mole-deg, deduced from the magnetic measurements is in substantial agreement with the previously determined calorimetric value. (auth)

Neutrons

12632 AERE-R/R-2501

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

AN EXPERIMENTAL STUDY OF THE SLOWING DOWN OF FISSION NEUTRONS AND THE DIFFUSION OF THERMAL NEUTRONS IN GRAPHITE AND IN HETEROGENEOUS MIXTURES OF BISMUTH AND GRAPHITE. W. G. Davey, J. C. Field, J. C. Gilbert, and A. L. Pope. Mar. 1958. 79p. $2.34(BIS).

The experimental determination of the slowing down areas of fission neutron and the diffusion areas of thermal neutrons in graphite and bismuth–graphite mixtures is described. The results are compared with other data, and a series of slowing down and diffusion areas recommended. (auth)

12633 AERE-T/R-239

United Kingdom Atomic Energy Authority. Research Group, Atomic Energy Research Establishment, Harwell, Berks, England.

THE MIGRATION LENGTH OF NEUTRONS IN AN INFINITE LATTICE. Third Report. D. J. Behrens. 1958. Date of MS. Aug. [6], 1948. Decl. Jan. 1956. 12p. $0.45(BIS).

In two earlier reports (A.E.R.E. T/R 103 and A.E.R.E. T/R 221) methods of calculating the migration length of neutrons in a system containing holes were developed. No allowance was made for the holes being situated, in a pile of the conventional type, round the rods of fissionable material. It is found that the migration length is increased less by such a lattice packing than it would be by a random arrangement of holes to which the earlier work would apply. A quantitative measure of the change is obtained, and the results obtained are in very fair agreement with an empirical formula for migration lengths recently quoted in report A.E.R.E. T/R 238. (auth)

12634 ORNL-2456

Oak Ridge National Lab., Tenn.

A MODIFICATION OF THE SPHERICAL HARMONICS METHOD IN NEUTRON TRANSPORT THEORY. A. Sauer. Feb. 7, 1958. 17p. Contract W-7405-eng-26. $0.75(OTS).

The oscillatory character and the consequent poor convergence of the spherical harmonics method which arises when it is applied to a discontinuous problem is remedied by an appropriate modification. The new

method is applied to the plane Milne problem, and the results compared with those obtained from both the conventional spherical harmonics method and Yvon's modification. (auth)

12635 WAPD-PM-12

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh; and Westinghouse Electric Corp. East Pittsburgh, Penna.

SLOWING DOWN OF FISSION NEUTRONS IN HYDROGENOUS MIXTURES. DESCRIPTION OF MUFT-II CODE. R. L. Hellens, B. H. Mount, and W. L. Long. Mar. 1955. 15p. Changed from OFFICIAL USE ONLY, July 18, 1956. $3.30(ph OTS); $2.40(mf OTS).

The IBM Card-Programmed Electronic Calculator code developed for the calculation of the Fourier transform of the slowing down density of neutrons in hydrogenous mixtures is described. The code is arranged to provide directly the two group fast constants, ϵ, p, D_f, τ, and Σ_f. (W.D.M.)

12636

MECHANICAL SELECTOR FOR THERMAL NEUTRONS. G. Gobert and B. Jacrot (Section des Réactions Nucléaires à Basse Énergie, C. E. N., Saclay, France). J. phys. radium 19, Suppl. No. 4, 51A-60A(1958) Apr. (In French)

A mechanical selector of slow neutrons is described. It is constructed of two rotors (diameter 1 m) separated by 1 meter distance. The rotation speed is 6,000 rpm. The width of the line obtained is — in the best conditions — 50 μs. Mechanical problems encountered during the construction are analyzed. (auth)

12637

MEASURING REACTOR SPECTRA WITH THRESHOLDS AND RESONANCES. J. B. Trice (Oak Ridge National Lab., Tenn.). Nucleonics 16, No. 7, 81-3(1958) July.

Fission probes and activation detectors were used to measure and compare the neutron spectra in the Bulk Shielding Reactor, the Low Intensity Test Reactor, the ORNL Graphite Reactor, and the Materials Testing Reactor. The method used (utilization of the resonance and threshold reactions) is sensitive to cross-section data and can become an incisive approach to knowledge of reactor neutron spectra. (J.S.R.)

12638

SCATTERING OF SLOW NEUTRONS BY A LIQUID. George H. Vineyard (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 110, 999-1010(1958) June 1.

The differential cross section for coherent scattering of thermal neutrons by a liquid is given in general by the Fourier transform of a time-displaced radial density function. It is suggested that, to an adequate degree of approximation, this time-displaced function can be expressed as a convolution of the ordinary radial density function with a self-diffusion function describing the wandering of an atom from an arbitrary initial position. The neutron scattering cross section then becomes the product of the Fourier transforms of these two functions. One of the transforms is the differential cross section for x-ray scattering and describes interference effects, the other governs the energy changes upon scattering. In this development the scatterer can be treated either quantum mechanically or classically. Recoil effects are not provided by the classical treatment, but this is a significant deficiency only in liquids of low atomic weight. Several models for calculating the self-diffusion function are considered, and from these it is suggested that a Gaussian function with a time-dependent width is a reasonable approximation for the case of a simple liquid. The principal features of the width are deduced. Quantization of the scatterer effects the width at small times. At large times the width depends only on the coefficient of self-diffusion of the liquid, and inelastic scattering is suggested as a means of determining this coefficient, as well as other features of atomic movement. The accuracy of the static approximation for determining liquid structures by neutron diffraction is assessed by considering the typical case of liquid lead near its melting point, and is found to be moderately good. The extension of the entire formalism to the case of polyatomic liquids is outlined. (auth)

12639

MEASUREMENTS OF ASYMMETRIES IN THE DECAY OF POLARIZED NEUTRONS. M. T. Burgy, V. E. Krohn, T. B. Novey, and G. R. Ringo (Argonne National Lab., Lemont, Ill.) and V. L. Telegdi (Univ. of Chicago). Phys. Rev. 110, 1214-16(1958) June 1.

Previous measurements on the decay of polarized neutrons showed it to be non-isotropic with respect to the neutron spin. The coefficient for the correlation between the direction of emission of the beta particles and the neutron spin was shown to be too large in absolute value because of an interference from the correlation of neutrino direction with neutron spin. This correlation, of fundamental interest in beta-decay theory, was measured. The experimental apparatus is shown, and the results are tabulated. (D.E.B.)

12640

FLUCTUATIONS IN SLOW NEUTRON AVERAGE CROSS SECTIONS. P. A. Egelstaff (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Proc. Phys. Soc. (London) 71, 910-24(1958) June.

The wide distribution in the values of the neutron widths and spacings of slow neutron levels leads to fluctuations in the cross section averaged over several levels. A method of deriving information on the properties of these distributions from observations on the fluctuations is described. Fluctuations in total cross section measurments are analyzed and agreement to order of magnitude is obtained with the predicted width and spacing distributions, but it does not appear that exact agreement is obtained at present. The U^{235} fission cross section also is analyzed by this method, but the results do not agree with the theory of the method. It is probable that these discrepancies are due to the effect of correlations in the distributions. (auth)

Nuclear Physics

Refer also to abstract 12563.

12641 AECU-3696

Purdue Research Foundation, LaFayette, Ind.

RESEARCH IN NUCLEAR PHYSICS. Progress Report No. 8. June 15, 1958. 64p. Contract AT(11-1)-122. $10.80(ph OTS); $3.90(mf OTS).

A second set of quadrupole magnets was installed in the cyclotron close to the vacuum chamber in order to increase the beam intensity. The pole pieces of the 20-in. analyzing magnet were trimmed. Scattering of 19-Mev alpha particles by C^{12}, O^{16}, and S^{32} was investigated at various angles. Beta-gamma directional correlations of allowed as well as forbidden beta transitions in the decay of Na^{24}, Co^{60}, and Sc^{46} were investigated. Results of an experimental investigation of the beta-gamma directional correlation and the spectral shape of the

first-forbidden spectra of K^{42} and Au^{198} are presented. Polarization-directional correlation measurements were performed on the Ar^{38} cascade gamma rays following Cl^{38} decay in order to determine the parities of the levels and to remove some of the ambiguity of the directional correlation spin assignments. Nonconservation of parity in beta decay, circular polarization of gamma rays following beta decay, and polarization of conversion electrons following beta decay are considered. The transverse polarization of beta particles in the first-forbidden beta decay of Au^{198} was measured. A 4π beta spectrometer for the study of beta and gamma radiations associated with the decay of short-lived radio-nuclides has been constructed. The study of the 119-kev transition in the decay of the 4.9 hr In^{110m} has been continued. (For preceding period see AECU-3515.) (W.D.M.)

12642 HW-55879

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

NUCLEAR PHYSICS RESEARCH QUARTERLY REPORT [FOR] JANUARY, FEBRUARY, MARCH 1958. Apr. 29, 1958. 42p. Contract W-31-109-eng-52. $1.25(OTS).

The Pu^{239} and Pu^{241} fission cross sections were measured relative to the 1/v boron cross section using a thin window parallel plate ionization chamber containing foils of boron, Pu^{239}, and Pu^{241}. Total cross section results in the low energy region are tabulated for U^{235}, Cu, and Ir. Buckling measurements were made with 1.6% enriched U- water moderated systems to determine critical masses for nuclear safety specifications. Bucklings of 1.44% enriched slugs in a random array and 1.0% enriched slugs in uniform lattices are tabulated. The infinite medium, thermal neutron multiplication factor, k_∞, was obtained experimentally for a D_2O-moderated, air-cooled unit cell (supercell) which is actually a configuration of seven fuel assemblies having an 8-in. spacing. The central column of the supercell contains a 19-rod cluster of Al–Pu fuel elements and is surrounded by six nearest neighbors of 19-rod UO_2 fuel elements. Measurements of the infinite multiplication factor, k_∞, and the thermal utilization factor, f, of D_2O moderated lattices were made on a UO_2 fuel element consisting of a central rod and two concentric annuli of fuel. Results are given for an 8-in. triangular lattice, with air, D_2O, and H_2O coolants. A series of measurements to determine the fast fission factor, the resonance escape probability, and the initial conversion ratio for a representative Physical Constants Testing Reactor (PCTR) lattice were completed. The lattice investigated had an 8-in. triangular spacing with D_2O moderator and coolant. The fuel clusters contained 19 half-in. rods of natural UO_2. New measurements of the infinite multiplication factor k_∞ of a $7\frac{1}{2}$-in. graphite and natural U lattice were completed in the PCTR. (For preceding period see HW-54591.) (M.H.R.)

12643 NP-6801

Polish Academy of Sciences. Inst. of Nuclear Research, Warsaw.

EXCITED LEVELS OF NUCLEI WITH MIXED CONFIGURATIONS. I. METHOD OF CALCULATION. Report No. 23/VII. Z. Szymański. May 1958. 9p.

An attempt is made to calculate excited levels of nuclei in the intermediate mass region with the assumption that protons and neutrons are placed in different subshells. Residual interactions between all external nucleons are assumed and treated as a perturbation. Neither a seniority quantum number equal to one nor odd-odd nuclei are assumed. (M.H.R.)

12644 UCRL-3888

California. Univ., Berkeley. Radiation Lab.

BETA SPECTRA OF THE MIRROR NUCLEI WITH A-19 TO 39 (thesis). Jasper A. Welch, Jr. Aug. 2, 1957. 78p. Contract W-7405-eng-48. $12.30(ph OTS); $4.50(mf OTS).

The positron spectra and half lives of all the mirror nuclei ($Z = (A \pm 1)/2$ with $19 \leq A \leq 39$ were systematically measured with a 180° deflection uniform-magnetic-field spectrometer. The ground-state transition energies were used to compute Coulomb energy differences between mirror pairs. Deviations of these Coulomb energy differences from a smooth variation with A are explained in great detail by a nuclear shell model using an isotropic harmonic oscillator potential well. The data definitely support a symmetry for the proton wave functions characteristic of jj coupling in the state of lowest seniority, with magic number effects at Z = 14 and 16 as well as Z = 8 and 20. Comparison of the ft values obtained with experimental nuclear magnetic moments gives the following values for the partial coupling constants for the Fermi and Gamow-Teller β interactions: $g_F^2 = 1/6700$ sec^{-1}, and $g_{GT}^2 = 1/4800$ sec^{-1}. (auth)

12645

TOTAL ENERGIES OF DISINTEGRATION OF B EMITTERS AND MODELS OF SHELL LEVELS. M. E. Nahmias (Collège de France, Laboratorie de Physique et Chimie Nucléaires). J. phys. radium 19, 485-9(1958) Apr. (In French)

Plots of the total disintegration energy of β emitters as a function of the number of neutrons or protons show discontinuities for magic and semi-magic numbers for both nucleons. However some discontinuities in the two plots do not coincide, which is further evidence of the different behavior of protons and neutrons in the process of filling the nuclear shells. (auth)

12646

NUCLEAR ENERGIES AND THE SHELL MODEL. Nissan Zeldes (Hebrew Univ. of Jerusalem and Univ. of Birmingham, Eng.). Nuclear Phys. 7, 27-110(1958) June (1).

Various nuclear energetics data are interpreted according to the shell model in its simplest form, characterized by the "single particle" approximation (states of seniority 0 for the even group and seniority 1 for the odd group). The information gained thereby is applied in discussing the problem of the competition between nuclear shells. (auth)

12647

APPLICATION OF DISPERSION RELATIONS TO NUCLEON STRUCTURE. Katsumi Tanaka (Argonne National Lab., Lemont, Ill.). Phys. Rev. 110, 1185-9 (1958) June 1.

The dispersion relations derived by Chew et al. are used to carry out a covariant calculation of the form factors for the charge and magnetic moment of the proton. Root-mean-square radii of 0.64×10^{-13} cm for the charge distribution and 0.45×10^{-13} cm for the magnetic moment distribution are found on the assumption that the proton has a point core and that the coupling constant is $f^2 = 0.08$. Recoil terms tend to reduce the rms radii obtained from the static model. The higher-order mesonic corrections do not alter the qualitative behavior of the perturbation results. (auth)

12648

COMPARISON OF Σ^+p AND Σ^-n SYSTEMS. George A. Snow (U. S. Naval Research Lab., Washington). Phys. Rev. 110, 1192-7(1958) June 1.

Assuming that the nuclear interactions between Σ^-n and Σ^+p are charge-symmetric, the effect of the Coulomb potential in the Σ^+p system on the binding energy and wave function of a possible bound state of the Σ^+p system is calculated. Using a phenomenological square-well potential the binding energies, ϵ_+ and ϵ_-, of the Σ^+p and Σ^-n systems are determined. In particular, it is found that the limiting condition, $\epsilon_+ \to 0$, implies that ϵ_- is 0.38, 0.47, 0.62 Mev when the square-well range parameter, b, equals 1.4×10^{-13}, 1.0×10^{-13}, 0.6×10^{-13} cm respectively. If the Σ^-n interaction determines ϵ_- to lie in the small but finite region $0 < \epsilon_- < \bar{\epsilon}_-$, then the Σ^-n system is bound and the Σ^+p system unbound. Conversely, if Σ^+p is bound, then $\epsilon_- > \epsilon_-$. A brief discussion of the experimental situation with regard to these hyperon compounds is given. (auth)

12649

POSSIBLE NEW ISOBARIC STATE OF THE PROTON. Robert R. Wilson (Cornell Univ., Ithaca, N. Y.). Phys. Rev. 110, 1212-13(1958) June 1.

12650

ANTIPROTON ANNIHILATION INTO NEUTRAL PIONS. Glenn M. Frye, Jr. (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. Letters 1, 14-16(1958) July 1.

An antiproton annihilation event has been observed in an emulsion stack which gives evidence for an annihilation mode in which only neutral pions are produced. The antiproton comes to rest and the only visible annihilation products are two tracks of plateau ionization which at first were assumed to be pions. Scattering measurements, however, showed that prong 1 underwent a radiative collision 2.4 cm from the vertex. Thus it is an electron. Prong 2 is probably also an electron. The most likely explanation for the presence of an electron pair at the point of annihilation is that a neutral pion has decayed by the alternate mode $\pi^0 \to e^+ + e^- + \gamma$ and that the two tracks are a "Dalitz" pair. (L.T.W.)

12651

REST MASS OF THE NEUTRINO. J. J. Sakurai (Cornell Univ., Ithaca, N. Y.). Phys. Rev. Letters 1, 40-2(1958) July 1.

The old problem of the neutrino mass is examined in the light of recent advances in β-decay physics. The role played by the vanishing mass of the neutrino in the current theories of parity-nonconserving weak interactions is investigated. Modifications necessary in estimating the neutrino mass from the shape of the β spectrum when parity is not conserved are pointed out. It is shown that it is impossible to determine the neutrino mass from the energy difference between the H^3-He^3 mass difference and the extrapolated end-point energy in the β decay of H^3, and that the recent results of Friedman and Smith based on such a subtraction procedure throw no light on the neutrino mass. (M.H.R.)

12652

INELASTIC SCATTERING OF HIGH ENERGY NUCLEONS BY COMPLEX NUCLEI. I. SEMI-CLASSICAL FORMALISM. G. P. McCauley and G. E. Brown (Univ. of Birmingham, Eng.). Proc. Phys. Soc. (London) 71, 893-903(1958) June.

A formalism is developed for treating scattering processes in the several hundred Mev range in which the target nucleus is left in its ground state or in a low excited state. These processes will be described in terms of collisions between the incident particle and single nucleons of the nucleus, using approximations of a semi-classical nature. The inelastic processes can be regarded as single particle excitations, the effects of scattering by other nucleons being included in a distorting potential. The target nucleons are assumed stationary during the passage of the incident particle; it is demonstrated that this is a reasonable approximation. (auth)

12653

ELASTIC SCATTERING OF PIONS AT A BOUND NUCLEON. E. W. Laing (Univ. of Glasgow). Proc. Phys. Soc. (London) 71, 932-8(1958) June.

In the approximation of the single nucleon model for the nucleus, the effect of nuclear binding on pion-nucleon scattering is estimated using a variational method and neglecting nucleon recoil in intermediate states. Results are compared with those of a simple p-wave phenomenological theory. Similar cross sections are obtained except in the region of the p-wave resonance of free nucleon-pion scattering, where the phenomenological theory leads to a cross section an order of magnitude smaller. This result is unaffected when nucleon recoil is taken into account, but may be sensitive to the choice of trial wave functions used in the variational calculation. (auth)

12654

CONFIGURATIONAL MIXING IN β-DECAY THEORY. C. A. Caine (Clarendon Lab., Oxford). Proc. Phys. Soc. (London) 71, 939-56(1958) June.

The effect of simple configurational mixing, within the j-j coupling shell model, on the nuclear matrix elements for allowed beta-transitions of odd A nuclei is considered. It is shown that such mixing could be responsible for the unfavored nature of such transitions within the 2d and 1g shells. (auth)

12655

INELASTIC PROTON-PROTON CROSS SECTION ABOVE 7 Bev. K. I. Alekseeva and N. L. Grigorov (M. V. Lomonosov Moscow State Univ.). Soviet Phys. (Doklady) 2, 514-17(1957) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 6773.

12656

NUCLEAR QUADRUPOLE MOMENTS. A. N. Kushnirenko (T. G. Shevchenko Kiev State Univ.). Soviet Phys. (Doklady) 2, 568-9(1957) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 6774.

12657

PHYSICS OF NUCLEAR REACTIONS AT LOW AND MEDIUM ENERGIES. A. I. Baz and L. N. Samoilov. Vestnik Akad. Nauk S.S.S.R. 28, No. 4, 97-102(1958) Apr. (In Russian)

Reports presented at the All Union Conference on nuclear reactions at low and medium energies, held in Moscow, Nov. 1957, were concerned with the nuclear shell, optical, and collective models. Also, reports and discussions were presented on the subjects of light nuclei, α particles at 22 and 24 to 25 Mev, polarization of particles, interactions of fast neutrons, photonuclear reactions, Coulomb excitations, heavy ions, and conservation of parity. (R.V.J.)

Nuclear Properties

12658 BNL-325(2nd. Ed.)
[Nuclear Cross Sections Advisory Group, AEC.]
NEUTRON CROSS SECTIONS. Donald J. Hughes and Robert B. Schwartz [Brookhaven Neutron Cross Section Compilation Group]. July 1, 1958. 376p. $4.50(OTS).

The material in the first edition of BNL-325 and its addendum, the supplement, and new data received up to May, 1958 are included. Thermal cross sections, resonance parameters, and cross section curves are given. (M.H.R.)

12659 UCRL-8289
California. Univ., Berkeley. Radiation Lab.
DECAY SCHEMES. D. Strominger and J. M. Hollander. June 1958. 50p. Contract W-7405-eng-48. $1.50 OTS).

The disintegration schemes presented were constructed from information contained in the Table of Isotopes, by Strominger, Hollander, and Seaborg, published as a supplement to the April, 1958, issue of the Reviews of Modern Physics. They are arranged according to mass number so as to show more clearly than was possible in the Table of Isotopes the various isobaric and parent-daughter relationships encountered in alpha and beta decay. References to the original literature are not given. (auth)

12660 AEC-tr-3260
DIVISION OF THE NUCLEI OF THE HEAVY ELEMENTS BY THEIR INTERACTION WITH THE NUCLEI OF CARBON, NITROGEN AND OXYGEN. Translated by Lydia Venters (Argonne National Lab.) March 1958. Translated from original unidentified Russian report. 27p.

Construction of a cyclotron source made it possible to produce intense beams of heavy ions of high currents. With the aid of this source a monochromatic beam of nuclei of C^{12}, C^{13}, N^{14}, and O^{16} was obtained from a 150-cm cyclotron which was used for studies of the interaction between accelerated heavy ions with the substance. Upon interaction of the multiply charged ions with the nuclei of heavy elements, compound nuclei are formed which are excited with energy equal to several tens of Mev. (auth)

12661
NUCLEAR POLARISATION BY THE OVERHAUSER EFFECT IN PARAMAGNETIC ION SOLUTIONS. Anatole Abragam, Jean Combrisson, and Ionel Solomon. Compt. rend. 245, 157-60(1957) July 8. (In French)

The extension of the Overhauser effect to solutions of paramagnetic ions with hyperfine structure has made it possible to increase a proton nuclear resonance signal to a considerable extent, to construct a proton oscillator of the "maser" type, and to provide a precise method for the measurement of the earth's magnetic field. (tr-auth)

12662
FIRST EXCITED STATES OF NEON-19. Roland Barloutaud, Pierre Lehmann, Antoine Leveque, Gérald C. Phillips, and Jacques Quidort. Compt. rend. 245, 422-4(1957) July 22. (In French)

Gamma transitions between the 240 and 280 kev levels, and the fundamental level in Ne^{19} were observed. The period for the 240 kev level is $(1.8 \pm 0.2) \times 10^{-8}$ s. The succession of these levels is the reverse of the levels of F^{19}. (auth)

12663
THE GIANT PHOTONUCLEAR RESONANCE IN THE RARE EARTH REGION. D. H. Wilkinson (Clarendon Lab., Oxford). Phil. Mag. (8) 3, 567-76(1958) June.

The giant resonances of nuclear photodisintegration show a strong correlation between their width and the distance from doubly closed shells. In particular the width becomes very great in the rare earth region of large permanent nuclear deformations. It is shown, with the aid of the Nilsson level schemes for a deformed harmonic oscillator potential, that the independent particle model of the giant resonance is capable of providing a quantitative explanation of this broadening. (auth)

12664
MASS, HALF-LIFE, AND EXCITED STATES OF B^8. K. L. Dunning, J. W. Butler, and R. O. Bondelid (U. S. Naval Research Lab., Washington). Phys. Rev. 110, 1076-9(1958) June 1.

The mass of B^8 has been determined by measuring the threshold energy of the reaction $Li^6(He^3,n)B^8$. Observations were made on both the neutrons from the reaction and the positrons from the decay of B^8. The threshold energy is 2.9661 ± 0.0017 Mev, giving a mass of 8.027157 ± 0.000008 amu for B^8. The half life of B^8 was measured to be 0.78 ± 0.01 sec. Evidence was found for possible excited states in B^8 at 0.6 ± 0.1 and 0.80 ± 0.05 Mev with respective widths of 0.2 ± 0.1 and 0.07 ± 0.04 Mev. Assuming that the decay proceeds exclusively to the 2.9-Mev state of Be^8, the log ft value is 5.7. (auth)

12665
LIFETIME OF THE 6.14-Mev 3^- STATE OF O^{16} BY A RECOIL METHOD. D. Kohler and H. H. Hilton (California Inst. of Tech., Pasadena). Phys. Rev. 110, 1094-1102(1958) June 1.

The lifetime of the 6.14-Mev 3^- state of O^{16} has been measured by means of a recoil technique. The spatial distribution of decays of recoiling O^{16} nuclei, produced by the reaction $F^{19}(p,\alpha_1)O^{16*}$, was studied with a highly collimated γ-ray detector. Comparison with the corresponding distribution obtained when the O^{16} nuclei were stopped at the target surface by an evaporated metallic layer provided a means of determining the lifetime. A value for this half life of $(8.6 \pm 4.0) \times 10^{-12}$ second [mean life, $\tau = (1.2 \pm 0.6) \times 10^{-11}$ sec] has been found, consistent with previously established limits. The measured value is compared with values predicted from various nuclear models. (auth)

12666
LIFETIME OF THE 473-kev LEVEL IN Tm^{169}. E. N. Hatch and D. E. Alburger (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 110, 1116-18(1958) June 1.

The lifetime of the 473-kev level in Tm^{169} has been investigated by means of an intermediate-image beta-ray spectrometer which was arranged for observing beta-gamma coincidences with a fast-slow coincidence system. From the distribution of delayed coincidences between 94-kev L-conversion electrons and K-capture x-rays, an upper limit for the half-life of the 473-kev level of 3×10^{-9} sec is assigned. It is concluded that the rotational interpretation for this level is most likely the correct one. (auth)

12667
EVIDENCE FOR THE PRESENCE OF E0 IN DIRECT COMPETION WITH M1 AND E2. T. R. Gerholm and B. G. Pettersson (Univ. of Uppsala). Phys. Rev. 110, 1119-22(1958) June 1.

Gamma-electron and electron-gamma angular directional correlation measurements have been obtained for the 334.0-356.5 kev cascade in Pt^{196} by use of a beta spectrometer and a NaI(Tl) scintillation detector. The result obtained for the $\bar{A}_2$ term in the gamma-electron case is in agreement with earlier gamma-gamma measurements by Steffen. The electron-gamma $\bar{A}_2$ term gives evidence for admixtures due to electric monopole internal conversion as predicted by Church and Weneser. (auth)

12668

CONTRIBUTION OF THREE-BODY FORCES TO THE BINDING OF HYPERFRAGMENTS. Richard Spitzer (Columbia Univ., New York). Phys. Rev. 110, 1190-1 (1958) June 1.

The potential energy of Λ in the hypertriton due to two- and three-body pion-exchange forces is estimated. The contributions from the two types of forces are found to be of the same order of magnitude, thus indicating that the three-body force produces the binding of Λ in the hypertriton. The role of the three-body force in the binding of other light hyperfragments is briefly discussed. (auth)

12669

SPIN OF Ni^{61}. H. H. Woodbury and G. W. Ludwig (General Electric Co., Schenectady, N. Y.). Phys. Rev. Letters 1, 16-17(1958) July 1.

The spin of the stable isotope N^{61} was directly observed to be $^3/_2$ from the electron spin resonance spectrum of Ni-doped germanium. (L.T.W.)

12670

ELECTRON-CAPTURE ENERGY AND LEVEL LIFETIME BY TEMPERATURE EFFECT IN Sm^{152} GAMMA-RAY RESONANCE. P. B. Moon, G. G. Shute, and B. S. Sood (Univ. of Birmingham, Eng.). Phys. Rev. Letters 1, 21-2(1958) July 1.

The experiment of Grodzins, irradiating Sm_2O_3 with the Sm^{152} gamma rays that follow electron-capture in Eu^{152m} and measuring the spectral distribution of radiation scattered at 100°, was repeated with a mean scattering angle of 90° and with somewhat different shielding arrangments. The temperature dependence of scattering for various capture energies is plotted. (M.H.R.)

12671

SPACINGS OF NUCLEAR ENERGY LEVELS. Norbert Rosenzweig (Argonne National Lab., Lemont, Ill.). Phys. Rev. Letters 1, 24-5(1958) July 1.

The ideas about the distribution law governing the spacings of adjacent energy levels, of the same spin and parity, of highly excited nuclei were studied by a numerical analysis. A set of 200 real symmetric matrices of order 20 was considered with matrix elements chosen at random from a symmetric uniform distribution. The results for the uniform distribution is shown in the form of a histogram. The calculations were repeated, with the matrix elements selected at random from a Gaussian distribution $(0,\sigma)$. Both sets of results confirm Wigner's conjectures that the distribution law for $\underline{x}$ (the value of a particular spacing divided by the mean value) does not depend sensitively on the precise distribution law for the matrix elements and that the correct $p(x)$ is given approximately by $p(x) = \pi/2 \times \exp(-\frac{1}{4}\pi x^2)$. (M.H.R.)

12672

ELASTIC SCATTERING OF ANTIPROTONS ON CARBON AT 30 TO 200 Mev. Lewis E. Agnew, Jr., Tom Elioff, William B. Fowler, Louis Gilly, Richard Lander, Larry Oswald, Wilson M. Powell, Emilio Segrè, Herbert M. Steiner, Howard S. White, Clyde Wiegand, and Tom Ypsilantis (Univ. of California, Berkeley). Phys. Rev. Letters 1, 27-9(1958) July 1.

The measurements yielded information on the antiproton-carbon scattering cross section for scattering angles of 5°(lab) or more. A total of 70 antiproton-carbon scattering events were seen in a total antiproton path length of 179 meters of liquid propane (density = 0.42 g/cm^3). The high ratio of the total antiproton cross section observed at higher energies on several elements also extends to the lower energies considered. (M.H.R.)

12673

ANGULAR DISTRIBUTIONS OF TRITONS FROM THE $C^{14}(d,t)\,C^{13}$ REACTION. W. E. Moore, J. N. McGruer, A. I. Hamburger (Univ. of Pittsburgh). Phys. Rev. Letters 1, 29-30(1958) July 1.

The reactions leading from the C^{14} ground state to the ground state and first excited states of C^{13} were studied using 14.8-Mev incident deuterons. Outgoing particles were magnetically analyzed and were detected by a CsI(Tl) crystal. The resulting pulses were sorted by a six-channel pulse-height analyzer. The targets were prepared by depositing carbon (enriched to 29% in C^{14}) on gold foil. Positive identification of the levels was made by substitution of a natural carbon target, and also by observation of the variation of recoil energy as a function of scattering angle. Experimentally observed angular distributions of tritons leading to the low-lying states C^{13} were compared with those predicted by the theory of Butler, and the results are shown. (M.H.R.)

12674

CONFIGURATION MIXING IN THE C^{14} GROUND STATE. Elizabeth Baranger and Sydney Meshkov (Univ. of Pittsburgh). Phys. Rev. Letters 1, 30-2(1958) July 1.

An analysis of recent $C^{14}(d,t)C^{13}$ experiments is presented which indicates that there is considerable configuration mixing in the C^{14} ground state. With a rather arbitrary choice of the C^{14} and N^{14} ground state wave functions, there seems to be enough mixing to produce the required cancellation of the C^{14} to N^{14} beta-decay matrix element, without invoking any tensor forces. In order to make a numerical estimate of the amount of admixture, the experimentally determined reduced widths are used. (M.H.R.)

12675

NUCLEAR SPIN OF ASTATINE-211. H. L. Garvin, T. M. Green, E. Lipworth, and W. A. Nierenberg (Univ. of California, Berkeley). Phys. Rev. Letters 1, 74-5 (1958) July 15.

A nuclear spin of 9/2 was measured for 7.2-hr At^{211} by the method of atomic beams. The At^{211} was prepared by bombarding a bismuth target with 29-Mev alpha particles. (W.D.M.)

12676

IMPACT PARAMETER TREATMENTS OF CERTAIN HYDROGEN-PROTON AND HYDROGEN-HYDROGEN EXCITATION COLLISIONS. D. R. Bates (Queen's Univ. of Belfast). Proc. Roy. Soc. (London) A245, 299-311 (1958) June 24.

Consideration is given to the impact parameter form of the Born approximation and of the pRA approximation (i.e. the first-order approximation to which the perturbed stationary state, or PSS, approximation tends). Calculations are carried out on the excitation of normal hydrogen atoms to the 2s or 2p states in encounters with protons and other normal hydrogen atoms. The results obtained provide some information on the range of validity of the Born approximation. The impact-parameter treatment corresponding to a simplified

version of the second Boron approximation is given and discussed. Attention is drawn to the fact that for certain transitions the pRA approximation fails seriously when the encounter is very close. (auth)

12677

THE CONVERSION SPECTRUM OF Ho^{160}. E. P. Grigor'ev, B. S. Dzhelepov, A. V. Zolotavin, B. Kratsik, B. K. Preobrazhenskii, and I. S. Ianchevskaia (A. A. Zhdanov Leningrad State Univ.). Soviet Phys. (Doklady) 2, 479-83(1957) Nov.-Dec.

The conversion spectrum which appears in the transformation $Er^{160} \rightarrow Ho^{160} \rightarrow Dy^{160}$ was investigated. A tabulation is given of the internal conversion lines. Because of the sensitivity of the measurements, it was possible to construct the decay scheme of Ho^{160}. (J.S.R.)

12678

ION SCATTERING COEFFICIENT AS A FUNCTION OF COLLIDING-PARTICLE MASS RATIO. U. A. Arifov, A. Kh. Ayukhanov, and S. V. Starodubtsev (Physico-Technical Inst., Academy of Sciences, Uzbek, S.S.R.). Soviet Phys. JETP 6, 653-7(1958) Apr.

The double-modulation method has been used to study secondary ion emission in the case in which the mass of the bombarding ion is greater than the mass of the target atom. It is shown that when Ni is bombarded by Cs ions or when Mo is bombarded by Ba ions no ions are observed at the "reverse" angle. When $V_i > \varphi$ secondary ion emission is not observed at any target temperature; when $V_i < \varphi$ the secondary ion emission which is observed at high target temperatures consists of ions which diffuse from the interior of the target and are evaporated at the surface. (auth)

12679

SELECTION RULES FOR ELECTROMAGNETIC TRANSITIONS IN DEFORMED NUCLEI. M. E. Voikhanskii (A. J. Herzen Leningrad Pedagogical Inst.). Soviet Phys. JETP 6, 771-5(1958) Apr.

Selection rules for electromagnetic transitions have been obtained for the following asymptotic quantum numbers of deformed nuclei: Ω, Λ, and Σ (the projections of the total, the orbital, and the spin angular momentum respectively of a particle on the axis of an elongated nucleus), n_z (the oscillator quantum number along the axis), and N (the principal oscillator quantum number). Taking into account these selection rules allows an explanation of the discrepancies between theoretical and experimental values of transition probabilities. A first order forbiddenness in one of the asymptotic quantum numbers decreases the transition probability by a factor 10 to 100. (auth)

12680

CONTRIBUTION TO THE DECAY SCHEME OF PALLADIUM-105. Rudolf Boedege (Univ. of Bonn). Z. Physik 151, 483-6(1958). (In German)

The conversion coefficients α for the 642- and 436-kev γ transitions in Pd^{105} were determined by the comparison method with a β spectrometer. The values found, $\alpha(642 \text{ kev}) = (1.3 \pm 0.2) \times 10^{-3}$ and $\alpha(436 \text{ kev}) = (8.1 \pm 1) \times 10^{-3}$, were used with other measurements to determine a decay scheme for this cascade. (tr-auth)

Nuclear Reactors

Refer also to abstracts 12144, 12332, and 12564.

12681 AE-1

Aktiebolaget Atomenergi, Stockholm.

CALCULATION OF THE GEOMETRIC BUCKLING FOR REACTORS OF VARIOUS SHAPES. N. G. Sjostrand. Oct. 1957. 23p.

A systematic investigation is made of the eleven coordinate systems in which the reactor equation $\nabla^2\phi + B^2\phi = 0$ is separable. The fundamental solution and geometric buckling are given for those cases where the separated equations lead to known functions. It is especially shown that reactors of prolate and oblate spheroidal shape can be calculated in detail, and the results are given in extensive tables. (auth)

12682 AE-2

Aktiebolaget Atomenergi, Stockholm.

THE VARIATION OF THE REACTIVITY WITH THE NUMBER, DIAMETER AND LENGTH OF THE CONTROL RODS IN A HEAVY WATER NATURAL URANIUM REACTOR. H. McCririck. Feb. 1958. 24p.

Starting with the known reactor constants for a heavy water moderated reactor with reflector and a given number of control rods of a certain size, the reactivity equivalence of the control rods is calculated. The calculation is given in detail. The number, length and diameter of the control rods is then varied and the effect of these parameters on the reactivity is shown graphically. Flux plots are also given for the reactor with and without control rods. (auth)

12683 AECD-4253

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

BORON-STAINLESS STEEL CONTROL CALIBRATIONS. F. J. Jankowski and D. Klein. Aug. 29, 1955. Decl. with deletions May 6, 1957. 5p. $1.80(ph OTS); $1.80(mf OTS).

Boron–stainless steel rods were investigated for use as control rods; the boron enrichments tested were 0.96, 1.18, 1.64, 3.1, and 5.3% natural boron. The test results are given as a comparison to hafnium. (J.R.D.)

12684 AECU-3704

Allis-Chalmers Mfg. Co. Nuclear Power Div., Milwaukee.

NUCLEAR SUPERHEATER FOR A CONTROLLED RECIRCULATION BOILING REACTOR. Interim Feasibility Report. May 9, 1958. 32p. For Northern States Power Co. and Central Utilities Atomic Power Associates. Contract AT(11-1)-589. (ACNP-5808). $6.30(ph OTS); $3.00(mf OTS).

The objective of this study was to determine and evaluate a means of improving and simplifying the boiling water reactor cycle through use of a nuclear superheater. The steam generated by this two-region, single-core, boiling-superheating reactor is at 825°F and 540 psig. The basic design arrangement of the Sioux Falls Power Reactor which appears most feasible at this time incorporates a set of boiling fuel elements surrounding a set of superheater elements, thereby comprising a two-region core. The outer region generates the steam which passes through the inner region to pick up superheat. (W.D.M.)

12685 AECU-3757(Pts. I and II)

Michigan. Univ., Ann Arbor. Engineering Research Inst.

TESTS ON MODELS OF NUCLEAR REACTOR ELEMENTS. I. HEAD LOSSES IN BLANKET SUB-ASSEMBLY. J. S. McNown, R. A. Yagle, and W. W. O'Dell. Mar. 1956. 20p. II. STUDIES OF DIFFUSION. J. S. McNown, C. S. Yih, R. A. Yagle, and W. W. O'Dell. Mar. 1957. 15p. For Atomic Power Development Associates, Inc. (ERI-2031-1-P and ERI-2031-2-P). $3.30(ph OTS); $2.40(mf OTS) ea.

These two parts were issued separately, but are cataloged as a unit.

For a model of a blanket sub-assembly of the proposed Atomic Power Development Associates reactor, laboratory measurements have been made of the head losses for the blanket element and for the various distributing orifices. Tests with water have been generalized so that the results provide design criteria for liquid sodium which is to be used in the reactor. (auth)

12686 AECU-3763

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

MECHANICAL AND THERMAL PROBLEMS OF WATER-COOLED NUCLEAR POWER REACTORS. N. J. Palladino and J. Sherman. [1955?]. 9p. $1.80 (ph OTS); $1.80(mf OTS).

Some of the principal problems faced in the mechanical and thermal design of the Shippingport Pressurized Water Reactor core are discussed. The interplay of these problems with the requirements of other technologies is discussed, and areas which need more work are outlined. (M.H.R.)

12687 AECU-3776

ARDE Associates, Newark, N. J.

FINAL STRESS ANALYSIS OF FWR SEED I, CORE I. Report No. 9561-3. R. Mark. Oct. 1957. 92p. For Westinghouse Electric Corp. Atomic Power Div. $15.30(ph OTS); $5.40(mf OTS).

The structural analysis of the PWR Core I Seed I under prescribed thermal and mechanical loading with the object of predicting the structural reliability of the seed during actual service is described. Static and fatigue tests performed on fusion-welded Zircaloy specimens are described, and the results of these tests are incorporated in the reliability study. The applied stresses in the seed during operation of the reactor are quite low except at the end welds. Here, based upon the test data, a safety factor of about $4\frac{1}{2}$ appears to exist for 6000 cycles of loading. (auth)

12688 AERE-R/R-2418

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

NEUTRON FLUX DISTRIBUTIONS IN LOOPS—AN ANALYSIS OF EXPERIMENTS IN DIMPLE. D. Hicks. Nov. 1957. 53p. $1.26(BIS).

The problem of calculating the thermal neutron flux in a reactor loop is considered. A simple model based on an electrical analogy to neutron diffusion theory (with empirical corrections) is developed. Predictions based on the model are shown to be in good agreement with experiments with dummy loops in the Dimple reactor. Semi-empirical methods are suggested for the treatment of air gaps and bars of enriched fuel. (auth)

12689 AERE-R/R-2537

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

A STUDY OF SINGLE-ZONE U_{233} THORIA SLURRY REACTORS. W. G. Clarke. Apr. 1958. 21p. (HARD(A)/P-48). $0.54(BIS).

Single-zone spherical power reactors comprising slurries of thorium oxide and U^{233} in heavy water at 265°C are considering. Initial uranium concentrations, conversion factors, and losses in protactinium and fission products are calculated for a wide range of reactor sizes and thorium oxide concentrations. (W.D.M.)

12690 AERE-R/R-2558

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

ATTENUATION STUDIES IN THE LIDO POOL. A. F. Avery and R. A. Dugdale. Apr. 1958. 15p. (SWP/P-47).

Measurements of neutron and gamma distributions in the Lido pool are described and the merits of the various instruments used are discussed. A theoretical estimate of the thermal flux distribution is made and compared with the data. (auth)

12691 AERE-T/R-221

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

CALCULATION OF THE NEUTRON MIGRATION LENGTH IN AN INFINITE LATTICE. D. J. Behrens. 1958. Date of MS. June 1948. Decl. Jan. 1956. 14p. $0.45(BIS).

The theory developed in a previous report (AERE-T/R-103) was applicable strictly only to the case in which the fissionable material and moderator were uniformly mixed throughout the solid material of the reactor. This is not the case for an ordinary pile, and we have now developed a theory consistent with the lattice geometry of such a pile. We find that, when the equivalent capture-width of the metal rods in the pile is of the order of a mean free path for thermal neutrons, the new theory gives results consistent with the old to within 1%. If the free paths were small compared with the rod capture-widths, however, appreciable discrepancies might be expected to show themselves. (auth)

12692 AMF-GR-6-57

American Machine and Foundry Co. Nuclear Engineering Lab., Greenwich, Conn.

HAZARDS SUMMARY REPORT. May 1957. 234p. For Union Carbide Nuclear Co.

The reactor planned by UCNC is a pool-type research reactor to be located in Sterling Forest, near Tuxedo Park, New York. Operation will be at thermal power levels up to 5 Mw with a corresponding average thermal neutron flux of 3.3×10^{13} n/cm^2/sec. MTR-type fuel elements are used and are arranged on a grid supported by a bridge spanning a two-section pool. Forced circulation of light water moderates and cools the reactor. The reactor can operate in either of two sections of the pool. The stall provides beam tubes, pneumatic rabbits, and a thermal column; the open or pool end permits bulk irradiation. A hydraulic rabbit, operating from the core support bridge, provides an additional irradiation facility. The pool-type reactor is housed in a reinforced concrete containment structure designed for low air leakage. Adjacent laboratories provide supporting facilities, including hot laboratories, shops, offices, and warm laboratories for implementing the research programs. This report reviews the many safety features planned for operation and incorporated in the design of the facilities. Natural hazards, minor accidents, maximum start-up accident, credible serious accidents, maximum credible accident, hypothetical accidents, and off-site hazards are reviewed, and methods for the prevention and containment of these accidents are discussed. (auth)

12693 ANL-5452
Argonne National Lab., Lemont, Ill.
DESIGN STUDY OF A NUCLEAR POWER PLANT FOR 100-KW ELECTRIC AND 400-KW HEAT CAPACITY. M. Treshow, A. R. Snider, and D. H. Shaftman. May 1955. Decl. June 9, 1958. 132p. Contract W-31-109-eng-38. $19.80(ph OTS); $6.30(mf OTS).

A conceptional design study was made of a low-power "package" reactor plant for the production of 100 kw of electrical power and 400 kw of heat at remote Arctic installations. The power plant steam generator is proposed to be an unmanned, heterogeneous, boiling-type reactor capable of continuous operation for extended periods. The design is based on data derived from experiments with boiling-type reactors conducted by Argonne at the Reactor Testing Station, Arco, Idaho. (auth)

12694 ANL-5566
Argonne National Lab., Lemont, Ill.
ALPR PRELIMINARY DESIGN STUDY (ARGONNE LOW POWER REACTOR). PHASE I. M. Treshow, E. Hamer, H. Pearlman, D. Rossin, and D. Shaftman. Apr. 20, 1956. Decl. June 9, 1958. 62p. Contract W-31-109-eng-38. $10.80(ph OTS); $3.90(mf OTS).

A preliminary design study, Phase I of the ALPR project, has been made in accordance with the Army Reactors Branch specifications for a nuclear "package" power plant with a 200 to 260 kw electric and 400 kw heating capacity. The plant is to be installed at the Idaho Reactor Testing Station as a prototype for remote arctic installations. The "conventional" power plant as well as the exterior reactor components are described, and cost estimates are given. "Nuclear" components of the reactor are described. (auth)

12695 APAE-34(Vols. I-III)
Alco Products, Inc., Schenectady, N. Y.
BI-METALLIC TUBE STEAM GENERATOR FOR APPR. VOLUME I. SPECIFICATIONS. VOLUME II. INSTALLATION PROCEDURES. VOLUME III. CHEMICAL TECHNOLOGY DESIGN ANALYSIS. June 25, 1958. (Vol. I, 28p.; Vol. II, 48p.; and Vol. III, 15p.). Contract AT(30-3)-327. (Vol. I, $4.80(ph OTS); $2.70(mf OTS); Vol. II, $7.80(ph OTS); $3.30(mf OTS); and Vol. III, $3.30(ph OTS); $2.40(mf OTS).

These three volumes were issued separately, but are cataloged as a unit.

Complete specifications and drawings are given for a bi-metallic tube steam generator replacement at Fort Belvoir, Virginia. Physical size limitations, shell side water volume, limitation, type of exchanger, materials of construction, conditions of service, required performance, and weight limitation are included. Procedures are outlined for removing the existing steam generator at APPR-1 and installing a new unit. The effect of replacing the present Type 304 stainless steel boiler with a bi-metallic tube steam generator was analyzed from the standpoint of chemical operations at the plant. Corrosion control procedures were established to prevent formation of deposits, scale, or pits on the boiler tubes as well as to protect other parts of the system. Water treatment procedures were revised to insure satisfactory operation of the boiler by removing dissolved oxygen, minimizing hideout and carryover, neutralizing carbon dioxide, and maintaining proper pH. The chemical feed system was revised to eliminate problems encountered with the present equipment and to obtain the reliability required with a less corrosion resistant boiler material. Operating procedures were reviewed to reflect the above and to switch emphasis from chloride to oxygen control in the make-up, storage, and condensate systems. (auth)

12696 APAE-Memo-115
Alco Products, Inc., Schenectady, N. Y.
ADDITIONAL MEASUREMENTS ON THE ARMY PACKAGE POWER REACTOR ZERO POWER EXPERIMENTS: ZPE-1 AND ZPE-2. H. W. Giesler. Nov. 15, 1957. Decl. May 19, 1958. 14p. $3.30(ph OTS); $2.40(mf OTS).

During the course of the ZPE-2 experimental program additional measurements were performed under the Alco Products Research and Development program. Included in this program were the evaluation of various absorber section compositions and reactivity studies designed to facilitate analytical techniques. The results of these measurements are presented. (auth)

12697 APEX-382
General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.
U.S. REACTOR OPERATING HISTORY, 1943-1956. J. Moteff. June 23, 1958. 46p. Contracts AF33(038)-21102 and AT(11-1)-171. $1.25(OTS).

The history of unscheduled scrams experienced with AEC reactors is summarized. Data were submitted on 83 reactors, of which 43 were research, prototype propulsion, or production units and 23 were critical assemblies. Because of the insufficiency of operating data from reactors put into operation during the latter part of 1956, information from 17 reactors was not included in this study. A large portion of the data was listed in the areas of unscheduled scrams, hours of operation, number of startups, and reactor power level. Also included were data related to any serious accidents (radiation overexposure to personnel) or instances of property damage (radiation contamination) in excess of $5000 per accident. (M.H.R.)

12698 BAW-1002
Babcock and Wilcox Co. Atomic Energy Div., [Lynchburg, Va.].
LIQUID METAL FUEL REACTOR EXPERIMENT. Monthly Progress Statement for December 1956. 17p. Contract AT(30-1)-1940. $3.30(ph OTS); $2.40(mf OTS).

Progress in the design and development of the Liquid Metal Fuel Reactor Experiment and its components is briefly reviewed. (M.H.R.)

12699 BAW-1003
BAW-1006
BAW-1010
Babcock and Wilcox Co. Atomic Energy Div., Lynchburg, Va.
LIQUID METAL FUEL REACTOR EXPERIMENT. Monthly Progress Statements for January, February, March 1957. (BAW-1003, 22p.; BAW-1006, 26p.; and BAW-1010, 21p.) Contract AT(30-1)-1940. (BAW-1003 and BAW-1006, $4.80(ph OTS); $2.70(mf OTS) ea.; BAW-1010, $3.30(ph OTS); $2.40(mf OTS)).

These three reports were issued separately, but are cataloged as a unit.

Progress in the design and development of the Liquid Metal Fuel Reactor Experiment and its components is briefly reviewed. (For preceding period see BAW-1002.) (M.H.R.)

12700 BAW-1013
BAW-1018
BAW-1020
Babcock and Wilcox Co. Atomic Energy Div., Lynchburg, Va.

LIQUID METAL FUEL REACTOR EXPERIMENT. Monthly Progress Statements for April, May, June 1957. (BAW-1013, 27p; BAW-1018, 25p.; and BAW-1020, 25p.) Contract AT(30-1)-1940. (BAW-1013, BAW-1018 and BAW-1020, $4.80(ph OTS); $2.70(mf OTS) ea.)

These three reports were issued separately, but are cataloged as a unit.

Progress in the design and development of the Liquid Metal Fuel Reactor Experiment and its components is briefly reviewed. (For preceding period see BAW-1010.) (M.H.R.)

12701 BAW-1026
BAW-1028
BAW-1029

Babcock and Wilcox Co. Atomic Energy Div., Lynchburg, Va.

LIQUID METAL FUEL REACTOR EXPERIMENT. Monthly Progress Statements for July, August, September 1957. (BAW-1026, 18p.; BAW-1028, 21p.; and BAW-1029, 19p.) Contract AT(30-1)-1940. (BAW-1026 and BAW-1028, $3.30(ph OTS); $2.40(mf OTS) ea.; BAW-1029, $4.80(ph OTS); $2.70(mf OTS)).

These three reports were issued separately, but are cataloged as a unit.

Progress in the design and development of the Liquid Metal Fuel Reactor and its components is briefly reviewed. (For preceding period see BAW-1020.) (M.H.R.)

12702 BNL-3247

Brookhaven National Lab., Upton, N. Y.

THE PRELIMINARY DESIGN OF THE LIQUID METAL FUEL REACTOR EXPERIMENT. Apr. 30, 1956. 130p.

The preliminary design of the Liquid Metal Fuel Reactor Experiment is presented. An effort has been made to touch on all the essential parts of a complete plant sufficiently to prepare such data as flow diagrams, layouts, equipment sizes, and the like. These were done with enough completeness to permit realistic cost estimates, but detailed engineering designs were not generally carried out. (W.D.M.)

12703 CEA-724

France. Commissariat à l'Énergie Atomique, Paris.

DISPOSITIF D'IRRADIATION BIOLOGIQUE A LA PILE EL 2. (A Device for Biological Irradiation in the EL2 Reactor at Saclay.) L. Fitoussi and G. Nichon. 1957. 5p.

The development of a special device adapted to an experimental channel of the EL2 reaction is presented. This device allows, during normal operation of the reactor at high power, to put into the experimental channel, and to extract from it, a cradle designed to contain objects or small animals to be irradiated. The device makes possible short-time irradiations in EL2. Particular care was given to the radiation shield. (auth)

12704 CEA-740

France. Commissariat à l'Énergie Atomique, Paris.

INFLUENCE DE LA FORME DES CELLULES SUR LE LAPLACIEN ET STRUCTURE FINE DU FLUX THERMIQUE DANS UNE PILE HÉTÉROGÈNE. (The Influence of the Form of the Cells on the Buckling and Fine Structure of the Thermal Flux in a Heterogeneous Pile.) B. Bailly du Bois. 1957. 33p.

The elementary diffusion equation and the age equation were solved for lattices assumed, to be infinite and periodic. In this way the influence of the form of the cells on thermal captures and resonance captures is determined. The solutions obtained are expressed by means of tabulated functions which can be used in the analysis of the f factor measurements. The case of mixed lattices in which different types of rods are regularly arranged is also foreseen. (auth)

12705 CENC-1002

Combustion Engineering, Inc. Nuclear Components Engineering Dept., Chattanooga.

REPORT OF SECOND THERMAL AND PRESSURE CYCLING OF HEAD PENETRATION SLEEVE. G. R. Boulden. May 1957. 45p. For [Westinghouse Electric Corp. Bettis Plant]. Contract CE-7954-25. $7.80 (ph OTS); $3.30(mf OTS).

The "head penetration sleeves" are screwed in attachments to the removable head of a pressurized water reactor vessel. This is the second thermal cycle test that has been run on the head penetration sleeve. The first test series consisted of thermal cycling without a constant pressure. A microscopic crack was found, and it was decided to run a second test to see if a constant pressure would alleviate the crack. (auth)

12706 CF-54-8-207

Oak Ridge National Lab., Tenn.

EFFECTS OF BERYLLIUM OXIDE DISTRIBUTED THROUGHOUT THE TBR BLANKET. P. N. Haubenreich. Aug. 30, 1954. Decl. Dec. 11, 1957. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

To investigate the effects of distributed beryllium oxide in the blanket, the following reactors were calculated: reactors with 0, 3, or 5 g of U^{233}/kg Th and 40 or 60% by volume in the blanket; 4- and 6-foot reactors with 3 g of U^{233}/kg Th and 40% beryllium oxide. The results show that the desirability of using distributed beryllium oxide is questionable. (J.R.D.)

12707 CF-54-9-25

[Oak Ridge National Lab., Tenn.]

HRT PRESSURIZER HEATER. J. A. Hafford and I. Spiewak. Sept. 2, 1954. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The electric pressurizer heaters were designed for inherent safety and ease of remote maintenance; they clamp around 2-in. pipes leading to the pressurizer and have a heating capacity of 7 kw. Two such heaters were tested on a length of 347 stainless steel pipe capped on each end to make a bomb with provisions inside for measurement of temperature and pressure. The test section was half filled with water, and the heaters were operated at various power levels, including a grounding test on the zinc fusible plug. The heaters proved reliable; however, the aluminum matrix around the calrod units tended to bond to the bomb after prolonged heating. This was prevented by insertion of a thin sheet of steel between the aluminum and the pipe wall to ensure separation. (J.R.D.)

12708 CF-55-5-32

Oak Ridge National Lab., Tenn.

BORON PLATE SPECIFICATIONS FOR APPR CRITICAL EXPERIMENT. J. G. Gallagher and R. R. Bate. May 4, 1955. Decl. Sept. 1957. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A general discription of the boron carbide plate is given along with design data, material specifications, material identification, and method of plate inspection. (J.R.D.)

12709 CF-57-5-31

Oak Ridge National Lab., Tenn.

TWO GROUP CALCULATIONS FOR FLUX DISTRIBUTION AND CRITICAL MASS IN CLEAN COLD ORR

CORES. F. T. Binford. Mar. 11, 1958. 20p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

A series of two-group calculations was made on the Oracle for the purpose of obtaining critical-mass and flux distribution data for various ORR core configurations. The 3G3R code of Bate, Einstein, and Kinney was used, together with the RSP code developed by Nelson. This made is possible to obtain results for the three-dimensional case. The results, which are presented graphically, are intended to serve as a guide for the design of experiments until such time as actual measurements are available. The calculations were performed for the "clean cold" case, and it should be realized that the presence in the core of experiments and of fission products built up during operation will materially alter the flux patterns found. It is believed that the critical-mass data are accurate to within 10%. Within the fuel region it is believed that the thermal-flux patterns are also accurate to this degree. Comparison of the results with MTR critical experiments, however, indicates that the thermal flux in the reflector in the vicinity of the fuel-reflector interface may have been underestimated by a factor of as much as 1.3. It should also be recalled that in a two-group calculation the "fast flux" is often a poor estimate of the actual distribution of high-energy neutrons. (auth)

12710 CF-58-2-144
Oak Ridge National Lab., Tenn.
HRE-3 PRESSURIZER DESIGN. J. C. Bolger, and R. O. Maak. Feb. 1, 1958. 24p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

A conceptual design is presented for the HRE-3 core and blanket pressurization systems. In general, the systems are similar to the preliminary designs previously described. Flowsheets, conceptual sketches, and specifications for the major components are included. Estimation of the D_2 concentration in the blanket is treated in detail. The design appears to be safe with regards to the D_2 explosion hazard. (auth)

12711 CF-58-4-10
Oak Ridge National Lab., Tenn.
FREQUENCY RESPONSE ANALYSIS OF THE HRT FEEDWATER CONTROL SYSTEM. S. J. Ball. Apr. 4, 1958. 19p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A frequency response analysis is made of the HRT fuel feedwater system. The characteristics of the components are determined and used in the differential equation of the system. Using frequency response techniques, theoretical calculations of static and dynamic response characteristics are made for reactor operation at 5 Mw. The conclusions arrived at as a result of this analysis include suggestions for improving the present operation. (auth)

12712 CF-58-6-17
Oak Ridge National Lab., Tenn.
DYE RETENTION TIME STUDIES IN MODELS OF POSSIBLE HRE-3 CONFIGURATIONS. W. R. Mixon and H. C. Claiborne. June 6, 1958. 19p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Dye hold-up time studies were completed for three $\frac{1}{16}$-scale lucite models of possible HRE-3 configurations. The models studied had a spherical (#MF-2) and a cylindrical (#MF-1) core with flat heads on the pressure vessels. Model MF-2 was also run with a "dished" head on the pressure vessel (#MF-2D). Results for these models indicate a change from laminar to turbulent flow when the equivalent Reynolds number was within a range of 900 to 1,500. Better mixing was found in model MF-1 than in MF-2, but the difference was small beyond the transition point. Addition of a dished head to model MF-2 caused the dye hold-up times to decrease at Reynolds numbers less than 2,500. (auth)

12713 CF-58-6-111
Oak Ridge National Lab., Tenn.
MIXING OF HRT CORE AND BLANKET SYSTEMS THROUGH EXTERNAL CONNECTIONS. E. H. Gift, L. A. Haack, H. Hilvety, and H. A. McLain. June 27, 1958. 17p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Adequate mixing (80 lb/min or higher) of the core and blanket high pressure systems can be accomplished either by interconnecting the chemical plant process lines or by connecting the sample access holes of the core and pressure vessels. The cross connection of the chemical plant process lines would probably be the easiest to install and control, but if the stagnant space in the blanket corrosion sample port requires purging, it is recommended that a connection between the access holes be made. (auth)

12714 CF-58-6-112
Oak Ridge National Lab., Tenn.
A REVIEW OF THE DATA AND OBSERVATIONS TAKEN FOR THE PURPOSE OF LOCATING AND ESTIMATING THE SIZE OF THE HOLE IN THE CORE. R. Van Winkle and R. H. Guymon. June 13, 1958. 19p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Two different measurements of the weight of D_2O required to fill the blanket to the level at which spillover into the core occurs and visual observation of this level, using a periscope, places the elevation of the hole (or crack) in the core vessel within about $\frac{1}{2}$ in. of 812 ft 5 in., or approximately 1 to $1\frac{1}{2}$ in. below the intersection of the 30 and 90° cones. The inherent errors involved in estimating a liquid level in the high-pressure system by weighing the liquid drained to the low-pressure system and referring to a calibration of volume vs. elevation are greater for the core than for the blanket. An indication of the approximate size of the hole in the core was obtained by measuring the difference in liquid levels between the core and blanket, using bubbler probes, as D_2O was caused to flow at measured rates from core to blanket, or vice versa. Heads of approximately $\frac{1}{8}$ to approximately $\frac{3}{4}$ in. were observed for flows in the range 19 to 65 lb/min., indicating a flow area of about 1.4 square inches, assuming a sharp-edged submerged orifice. (auth)

12715 CF-58-7-36
Oak Ridge National Lab., Tenn.
ESTIMATED FLOW RATES IN HRT FUEL AND BLANKET HIGH-PRESSURE SYSTEMS. R. Van Winkle and D. Bruley. July 3, 1958. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Pressure drop measurements across the fuel and blanket heat exchangers at various temperatures indicate that the volumetric flow rate of H_2O in the HRT high-pressure circulating systems at the time of the measurement were as follows:

Temperature °C	Fuel System Flow Rate gpm	Blanket System Flow Rate gpm
150	422	254
175	434	255
200	440	260
225	453	266
250	458	270
280	465	266

It is believed that the volumetric flow rates of D_2O or of dilute UO_2SO_4-H_2O (or D_2O) solutions in all HRT runs through Run No. 16 are close enough to those listed above to be used for heat removal calculations if the average of the solution inlet and outlet temperatures in the heat exchangers are used. (auth)

12716 COO-240
Naval Research Lab., Washington, D. C.
PROGRESS REPORT ON FAST BREEDER REACTOR SAFETY STUDIES. L. A. Beach, A. G. Pieper, and M. P. Young. [1957]. 26p. Contract [AT(11-1)-607]. (NRL-Memo-803). $4.80(ph OTS); $2.70(mf OTS).

A proposal was made to ANL for NRL to construct a gamma ray pin-hole camera to follow the flow of molten fuel elements by observing the emitted gamma rays with a TV chain viewing an image of the fuel elements on a NaI screen. However, an alternative system has been proposed that will give the same space resolution, improved time resolution and dynamic range with greater flexibility and reduced cost. This system consists of a rotating cylinder with a large number of small collimating holes scanning across the test section. Signals from scintillation detectors placed behind the drum will intensity modulate the Z axis of multigun oscilloscopes. A continuously moving film camera will record these sweeps for study and analysis. (auth)

12717 EES-040126
Naval Engineering Experiment Station, Annapolis.
INVESTIGATION OF DOUBLE TUBE SHEET DESIGN FOR CONDENSERS FOR NUCLEAR PROPELLED VESSELS. M. R. Gross and H. C. Ellinghausen. May 31, 1957. 13p. (AD-135136).

The effect of spacing and displacement on the expected life of double tube sheet condensers is described. A simple jig having a fixed and movable tube sheet connected by a single 70 : 30 or 90 : 10 copper–nickel condenser tube is used to study the various factors. Relationships between spacing, displacement, and cycles to failure are presented. It is concluded that a 3-in. spacing is necessary to fulfill the prescribed conditions of a 70 : 30 tube operating at a displacement of $^1/_{16}$ in. for a minimum of 4,000 cycles. (auth)

12718 HW-48800(Rev.)
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
PLUTONIUM RECYCLE TEST REACTOR PRELIMINARY SAFEGUARDS ANALYSIS. N. G. Wittenbrock, ed. June 5, 1958. 261p. Contract W-31-109-Eng-52. $4.00(OTS).

The design, site, and operation of the PRTR, a vertical pressure tube type heavy water moderated and cooled 70 Mw(th) reactor, are presented. A revision of the preliminary safeguards analysis evaluating the design revisions and the further defined reactor physics constants has been completed. (W.D.M.)

12719 HW-54637
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
REACTIVITY OF NEUTRON REFLECTED SYSTEMS. Norman Ketzlach. Jan. 21, 1958. Decl. Mar. 13, 1958. 11p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

Theory is developed can calculations are given which show that in determining how much enriched uranium can be surrounded by natural uranium, the size of the container must be considered, as an infinite amount of irradiated natural uranium could possibly be made critical by itself. (T.R.H.)

12720 IDO-16460
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
THE APPLICATION OF STATISTICAL METHODS OF ANALYSIS AND EXPERIMENTAL DESIGN IN PREDICTING BURNOUT HEAT FLUX. R. T. Jacobs, J. A. Merrill, and R. J. Nertney. June 10, 1958. 34p. Contract AT(10-1)-205. $1.00(OTS).

Statistical methods have been applied to the subcooled burnout data published by UCLA, Purdue, BMI, and McAdams to obtain a single correlation relationship of the polynomial type. Tests of significance were used for each variable in the correlation polynomial to make sure they add to the ability to predict burnout. Another correlation using independent variables instead of the dependent variable of Δ T sub is presented. The advantages of the systematic statistical approach for the analysis of existing burnout data are discussed. Also, the advantages of using factorial designs, fractionally replicated, for future experimental work are presented. (auth)

12721 INTERNUC-4
Internuclear Co., Inc., Clayton, Mo.
SUMMARY REPORT ON THE RER AND SDR CORE PHYSICS. July 23, 1956. 96p. For General Electric Co. Atomic Power Equipment Dept.

The reactor physics problems pertinent to the design of the reactor cores, supporting installations, and accessory equipment of the Radiation Effects Reactor (RER) and the Shield Development Reactor (SDR) are covered. (W.D.M.)

12722 INTERNUC-22
Internuclear Co., Clayton, Mo.
HIGH FLUX REACTORS FOR UNIVERSITY RESEARCH. C. F. Leyse, W. S. Chmielewski, W. S. Delicate, W. A. Gbeaney, W. E. Knabe, M. J. Kornfeld, A. M. Larson, and J. E. Stewart. Mar. 1958. 259p. For Prudue Univ.

A description of the facilities and money required to conduct useful work with nuclear reactors designed for engineering test or research purposes is presented. This includes not only information on the nuclear, physical, and cost characteristics of various reactors suitable for university use, but also auxiliary information pertaining to hot caves, radiological laboratories hazards evaluation, site selection, and containment problems, so as to give an over-all picture of a nuclear research or engineering test facility. (W.D.M.)

12723 KAPL-1611(Del.)
Knolls Atomic Power Lab., Schenectady, N. Y.
REPORT OF THE PHYSICS SECTION FOR JUNE, JULY, AUGUST 1956. Decl. with deletions Nov. 21, 1957. 42p. Contract W-31-109-Eng-52. $7.80(ph OTS); $3.30(mf OTS).

Resonance integrals were calculated for U^{235} fission. Experimental results on the measurement of the capture-to-fission ratio of U^{233} are given. Features of the magnetic alpha analyzer are briefly described. Experiments with the 3-stage mass spectrometer are described. A mass spectrometric analysis of millimicrogram samples of Pu is shown. Lattice parameter measurements on irradiated and unirradiated cubic crystals are summarized. A theoretical study of x-ray scattering by irradiated crystals is included. A study was also made of the fast neutron irradiation of semiconductors. Changes in carrier concentrations of Ge materials exposed to TTR neutrons are tabulated. A further study was made of the pulses produced by 5-Mev α particles in gold-doped Si. The breeding possi-

bilities calculated for the KAPL Fast Oxide Breeder were shown to be consistent with reactor measurements of the neutron economy of Pu^{239} made in the EBR. (B.J.H.)

12724 KLX-1782

Vitro Engineering Co., New York.

INERT GAS SYSTEM HAZARDS ANALYSIS FOR ATOMIC POWER DEVELOPMENT ASSOCIATES, INC. Vitro Job No. 1221. R. Epstein and L. Geller. Apr. 25, 1957. 29p. $3.30(ph OTS); $2.40(mf OTS).

The radioactivity of the inert gas system of the Enrico Fermi Fast Breeder Reactor Plant was analyzed under normal operating conditions, after an instantaneous fission product release from 10% of a subassembly, and during a continuous fission product release at 10% of the production rate. (auth)

12725 NAA-SR-2689

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

THERMAL TRANSIENT BEHAVIOR OF THE NEUTRON SENSOR OF A REACTOR SAFETY DEVICE. S. H. Fitch and T. H. Springer. June 7, 1958. 24p. Contract AT-11-1-GEN-8. $0.75(OTS).

The thermal transient behavior of the fuse component of a reactor safety device has been investigated in the KEWB I reactor. The fuse is a neutron flux sensor which, at excessive flux levels, will trip the safety device and cause reactor shutdown. Experimental results on the majority of reactor transients were in good agreement with calculations. However, on the fastest transients, experimental results were obscured by spurious effects during those intervals when the radiation level was high. It was not possible to demonstrate reactor shutdown with the safety devices because the inherent shutdown mechanism of the KEWB reactor was too efficient. The integrated neutron flux levels attained with the fastest transients were insufficient to cause the fuse to trip starting from ambient temperatures. Nevertheless, those tests have shown that the fuse component design is adequate for the high power level reactors for which it is intended. A successful trial run was made to demonstrate fuse tripping on transient neutron flux by heating the fuse to about 20°C above ambient temperature prior to the beginning of the transient. (auth)

12726 NAA-SR-Memo-456(Del.)

North American Aviation, Inc., [Downey, Calif.].

RESPONSE OF PPRE TO A SUDDEN INCREASE IN REACTIVITY. J. E. Garvey, D. L. Hetrick, and E. R. Cohen. Oct. 28, 1952. Decl. with deletions Oct. 16, 1957. 25p. $4.80(ph OTS); $2.70(mf OTS).

The response of PPRE to a sudden increase in reactivity was investigated. An incident was initiated by the dropping of an external cluster ($3 maximum $\Delta\rho$) into the core. The reaction was restrained and shutdown assured by the negative prompt temperature coefficient of reactivity. The relative power reached a maximum of 184 and, following the dropping of the four central clusters upon the melting of the steel cans, returned to 1 at about 1.2 sec after the incident was inaugurated. The maximum fuel temperature at this time was 2500°C. The energy release in the incident was 2.54×10^8 calories corresponding to 37 sec of normal operation. (auth)

12727 NAA-SR-Memo-1822

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

THE CRITICAL ASSEMBLY OF OMRE. Bernard R. Moskowitz. Apr. 25, 1957. 23p. $3.30(ph OTS); $2.40(mf OTS).

The critical assembly of OMRE will be performed in the reactor core vessel with moderator present. Nuclear control will be furnished with the modified reactor control rod system, the reactor detectors, and the auxiliary neutron counters. The mechanical arrangement of the rod system is pre-set during the time when the reactor core vessel is dry. The components are dowelled and referenced so that they may be accurately re-assembled when the core is wet. The fuel and source loading procedure is checked both in the dry and wet configuration. The critical assembly of the core is performed with the usual counting data and reciprocal multiplication curves. The core is then loaded with fuel and dummies to an excess reactivity which may be overcome at all temperatures with the two inner rods fully removed. The inner fast rod is calibrated by the period method. The inner and outer rod banks are calibrated against the fast rod and against each other by intercalibration with the servo-controller. The temperature coefficient of reactivity is measured by heating the plant with induction heating and nuclear heat. The rod drop times are measured, and flow, pressure, power, stability, and oscillator tests are performed. (auth)

12728 NDA-014-180

Nuclear Development Associates, Inc., White Plains, N. Y.

SMALL-PARAMETER ANALYSIS OF THE REACTOR DYNAMICS DURING THE INITIAL STAGES OF AN ACCIDENT. Harold G. Elrod, Jr. Dec. 1, 1957. 24p. For Atomic Power Development Associates, Inc. $4.80(ph OTS); $2.70(mf OTS).

A standard perturbation technique is used to obtain working formulas for neutron and precursor densities during the initial stages of a pile accident. The results illustrate the usefulness of small parameter techniques in the study of reactor dynamics. Application of such techniques to systems of equations involving non-linearities and feedback is asserted to be feasible. (auth)

12729 NDA-14-153

Nuclear Development Associates, Inc., White Plains, N. Y.

SPHERICAL AND CYLINDRICAL ADJOINT CALCULATIONS FOR THE APDA FAST BREEDER REACTOR. Leon Davidson and Carl Klahr. Nov. 14, 1956. 43p. For Atomic Power Development Associates, Inc. $7.80(ph OTS); $3.30(mf OTS).

The fluxes and adjoints for the Fermi Fast Breeder Reactor as functions of position and energy are presented in graphical form. The results were obtained from one-dimensional multigroup calculations on UNIVAC in spherical and cylindrical representations of the reactor. The graphs give results for groups 1,3,5, 7,9 at all space points. (W.D.M.)

12730 NDA-14-170

Nuclear Development Corp. of America, White Plains, N. Y.

THE DISTRIBUTION OF MELTING IN A SLOW MELT-DOWN ACCIDENT. H. G. Elrod. May 1, 1957. 28p. For Atomic Power Development Associates, Inc. $4.80(ph OTS); $2.70(mf OTS).

Revised edition of NDA-Memo-14-146.

Melting distributions are given for an hypothesized slow melt-down of the APDA reactor in the absence of sodium. Anticipated distributions of melting at various times after the start of the accident are computed on the assumption that the core retains its integrity. According to this hypothesis, melting starts at the core center 3.5

sec after initiation of the accident, and at the lower edges of the core after 22 sec. A maximum rate of melting of 0.46 ft^3/sec is achieved over the central period of the melt-down. If the fuel distribution is altered because of liquid run-off, the melting configurations of this report will be approximately reached at comparable values of integrated core power. (auth)

12731 NP-6633

United Kingdom Atomic Energy Authority. Industrial Group H. Q., Risley, Lancs, England.

STRESS RELIEVING ON THE CALDER HEAT EXCHANGERS. Report No. 5256. Sept. 8, 1955. 32p.

A detailed account of the high-frequency induction heating equipment and its method of operation at Calder Hall is reported. Drawings, photographs, and wiring diagrams are given. (auth)

12732 ORNL-2518

Oak Ridge National Lab., Tenn.

ATTENUATION IN WATER OF RADIATION FROM THE BULK SHIELDING REACTOR: MEASUREMENTS OF THE GAMMA-RAY DOSE RATE, FAST-NEUTRON DOSE RATE, AND THERMAL-NEUTRON FLUX. July 8, 1958. 2p. Contract W-7405-eng-26. $0.50 (OTS).

Measurements are presented in graphical form for reactor loading number 33. (W.D.M.)

12733 PRDC-TR-10

Power Reactor Development Co., Detroit.

MONTHLY TECHNICAL REPORT [FOR] APRIL 1958. 11p. Contract AT(11-1)-476. $1.80(ph OTS); $1.80 (mf OTS).

Thermal and biological shielding requirements are reviewed. A reevaluation of the delayed neutron fraction was made to include those neutrons produced in the blanket. Calculations of the decay heating due to heavy isotopes have been completed. The maximum permissible concentration in air of a mixture of fission gases was calculated to be 6×10^{-7} μc/cc. Ten specimens of U–10 wt. % Mo alloy were studied for cracking and splitting after irradiation to 2.5 at. % burnup. Two cermet specimens (27 wt. % UO_2 dispersed in a matrix of U–10 Mo) exhibited no visual indication of cracking or swelling after irradiation to 3.5 at. % burnup. Latest heat generation data for core performance of 300 Mw indicate a central metal temperature of 1133°F and 1281°F in the hottest subassembly, and for blanket performance at 300 Mw total power and 0.5 at. % blanket burnup central metal temperatures in excess of 1000°F for part of the subassemblies located in the high-pressure plenum. Thermocouples were tested for sodium leaks and grounding. The sealing properties of sodium and "Cerrobend" are being tested. (For preceding period see PRDC-TR-9.) (W.D.M.)

12734 PRDC-TR-11

Power Reactor Development Co., Detroit.

MONTHLY TECHNICAL REPORT [FOR] MAY 1958. 10p. Contract AT-(11-1)-476. $1.80(ph OTS); $1.80 (mf OTS).

The status of the design and fabrication of major components being procured for the Reactor Components Test is shown. Progress in nuclear engineering materials, fuel engineering, reactor vessel engineering, mechanical handling, liquid metal and steam system, and test operations are summarized. (For preceding period see PRDC-TR-10.) (M.H.R.)

12735 SPM-246

France. Commissariat à l'Energie Atomique, Paris.

INTERPRETATION DES RESULTATS OBTENUS PAR S. A. KUSHNERIUK ET C. McKAY. (Interpretation of the Results Obtained by S. A. Kushneriuk and C. McKay. (Report CRT-566).) A. Amouyal and P. Benoist. Mar. 6, 1957. 8p.

Addition to CEA-571.

The calculation of the thermal utilization factor described in CRT-566 can be approached in another manner. Instead of using the intermediary of a black-body cell one can determine directly the capture in the moderator by integration of the flux curve in the actual cell. By neglecting the perturbation in the neighborhood of the interface the characteristics of the interior region can be taken into account by a single parameter, the extrapolation length of the actual cell which determines the asymptotic elementary solution in the moderator. (J.S.R.)

12736 TID-7549(Pt. II)

American Nuclear Society, Oak Ridge, Tenn.; Atomic Industrial Forum, Inc., New York; and Atomic Energy Commission, Washington, D. C.

REACTOR SAFETY CONFERENCE [HELD AT] NEW YORK CITY, OCTOBER 31, 1957. 45p. $1.00(OTS).

Papers are presented on the economic aspects of reactor safety, reactor containment problems, hydrodynamic problems in reactor safety, the role of kinetic behavior in reactor safety, zirconium-water reaction data and its application to PWR loss of coolant accident, and experiments on the release of fission products from molten reactor fuels. Separate abstracts have been prepared for each paper. (M.H.R.)

12737 TID-7549(Pt. II)(p.1-6)

Babcock and Wilcox Co., New York and Consolidated Edison Co. of New York, Inc.

SOME ECONOMIC ASPECTS OF REACTOR SAFETY. D. Kallman and O. G. Hanson. p.1-6 [of] REACTOR SAFETY CONFERENCE [HELD AT] NEW YORK CITY, OCTOBER 31, 1957. 6p.

To summarize some of the economic aspects of reactor safety, three items which are related, but not additive are discussed. The operational safety precautions associated with the normal operation of the reactor are estimated to cost $6,100,000. The special safety equipment which is included for the prevention of the unexpected accident which may never occur and precautions which may at a later date prove to be unnecessary, amount to $8,400,000. Offsetting this cost one may wish to give consideration to the cost of a typical building equivalent to the containment sphere, at a cost of approximately $3,000,000. The net extra cost for the special safety equipment, taking into account a deduction for the typical building, may be $20 to $35/kw and is not the major factor in the planning for a nuclear power plant. (auth)

12738 TID-7459(Pt. II)(p.7-13)

Argonne National Lab., Lemont, Ill.

REACTOR CONTAINMENT PROBLEMS. R. O. Brittan. p.7-13 [of] REACTOR SAFETY CONFERENCE [HELD AT] NEW YORK CITY, OCTOBER 31, 1957. 7p.

Arguments are given for expressing the energy releases which give rise to containment problems in terms of calories or Btu's and seconds, rather than in pounds or tons of TNT. The economic aspects, construction problems, and sources of hazards in reactor containment are considered. (M.H.R.)

12739 TID-7549(Pt. II)(p.13-26)

[Illinois Inst. of Tech.], Chicago. Armour Research Foundation.

SOME HYDRODYNAMIC PROBLEMS IN REACTOR

CONTAINMENT. F. B. Porzel. p.13-26 [of] REACTOR SAFETY CONFERENCE [HELD AT] NEW YORK CITY, OCTOBER 31, 1957. 14p.

Some characteristics of strong shocks are noted: the Rankine-Hugoniot equations are general, a small temperature rise is equivalent to a large pressure change, the waste heat concept for energy dissipation, the small fraction of mechanical energy which appears at long distances, the tendency of the pressure-distance curves to decay rapidly until the crushing strength is reached, the relative insensitivity of total energy to the wave shape, the enormous preference for hydrodynamic energy to flow in rarefied media. These characteristics summarize the experience on the containment problems of the reactors analyzed. The methods of containment which are most profitable are usually blast shields or channeling. In the final analysis the duration of energy release, the isolation of structures by air gaps and the reflecting barriers are usually disappointing techniques for containment. (auth)

12740 TID-7549(Pt. II)(p.27-30)

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

THE ROLE OF REACTOR KINETIC BEHAVIOR IN REACTOR SAFETY. W. E. Nyer and S. G. Forbes. p.27-30 [of] REACTOR SAFETY CONFERENCE [HELD AT] NEW YORK CITY, OCTOBER 31, 1957. 4p.

Of the accidents peculiar to reactors, two are mentioned—stability and runaway—which are dependent upon kinetic behavior. The knowledge gained in the SPERT experiments is discussed. Examples of the gains expected from reactor kinetics experiments are given. (M.H.R.)

12741 TID-7549(Pt. II)(p.31)

[Westinghouse Electric Corp. Bettis Plant, Pittsburgh.]

ZIRCONIUM–WATER REACTION DATA AND APPLICATION TO PWR LOSS OF COOLANT ACCIDENT. B. Lustman and J. N. Chirigos. p.31 [of] REACTOR SAFETY CONFERENCE [HELD AT] NEW YORK CITY, OCTOBER 31, 1957. 1p.

Based on WAPD-SC-543, available from OTS, $1.25.

The reaction energy release, should the PWR core become uncovered both while the Zr alloy heats in the core structure and after the Zr has melted and drips into water, is predicted. (M.H.R.)

12742 TID-7549(Pt. II)(p.32-43)

[Oak Ridge National Lab., Tenn.]

EXPERIMENTS ON THE RELEASE OF FISSION PRODUCTS FROM MOLTEN REACTOR FUELS. George W. Parker and George E. Creek. p.32-43 [of] REACTOR SAFETY CONFERENCE [HELD AT] NEW YORK CITY, OCTOBER 31, 1957. 12p. (CF-57-6-87).

Also issued separately as CF-57-6-87 and previously abstracted in NSA, Vol. 11, abstract No. 11970.

12743 TID-10078

Knolls Atomic Power Lab., Schenectady, N. Y.

PLUTONIUM POWER REACTOR WITH OXIDE FUEL ELEMENTS. E. A. Luebke. May 24, 1954. Decl. Mar. 5, 1957. 18p. Contract W-31-109-Eng-52. $3.30 (ph OTS); $2.40(mf OTS).

Increased capital costs of a reactor power system make it desirable to seek reduced fuel charges below the 2 to 4 mils per kilowatt-hour of coal or oil-fired systems. An inexpensive procedure for recovering plutonium from the core and blanket of a breeder and refabricating it into fuel structures offers an attractive possibility for reducing fuel costs. A fuel element is described, consisting of plutonium and uranium oxide in steel tubing, which shows promise of a recovery and fabrication procedure with fewer steps than metal concepts, and which therefore should result in lower recycle costs. An oxide-filled fuel element with four atoms of U^{238} per plutonium, 35% void, in $\frac{1}{8}$-inch-ID steel tubing has 3 grams of plutonium per foot. If recycled at 50% burnup of the plutonium loaded and if chemical recovery costs $1 per gram plutonium and the fabrication cost is $5 per foot, the fuel recycle contributes only $\frac{3}{4}$ mil per kilowatt-hour to the cost of electricity. A fuel element test is proposed to demonstrate methods of fabricating the fuel element, determine ability to withstand high burnup, and develop procedures for dissolving the irradiated fuel mixture. (auth)

12744 UVAR-3 and Amendment

Virginia. Univ., Charlottesville. School of Engineering.

A HAZARDS SUMMARY OF THE PROPOSED RESEARCH AND TRAINING REACTOR. Lawrence R. Quarles and Walter P. Walker. [1956.] 81p. Amendment. [1957.] 10p.

The proposed reactor is of the proven pool type design, using highly enriched fuel plates with light water as the moderator, reflector, and coolant. The reactor will operate up to power levels of 100 kw with convection cooling only, employing forced circulation from 100 kw to its maximum power level of 1 Mw. Neutron fluxes of the order of 10^{13} neutrons/cm^2-sec are obtained at its maximum power level. For purposes of evaluation of the safety and adequacy of the design, a description of the facility, its site, major components, and normal operation, is included in this report. Sufficient climatological, hydrological, geological, and seismological data are presented for evaluating measures taken to protect the public from possible radioactive hazards. The hazard analysis shows that should the maximum assumed accident occur, evacuation of downwind personnel for several miles would be necessary; however, the intensity is sufficiently low to afford adequate time to accomplish this without exposing personnel to serious levels of radiation. It is not believed that any known mechanism could bring about this maximum assumed accident. (auth)

12745 WAPD-PA-145

[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.]

CALCULATION OF PWR PRIMARY LOOP PRESSURE DROPS. [Apr. 1955]. Changed from OFFICIAL USE ONLY June 27, 1958. 18p. Contract [AT-11-1-GEN-14]. $3.30(ph OTS); $2.40(mf OTS).

The estimated pressure drops to be used for the PWR primary loop piping, fittings, and boilers, are given. These pressure drops do not include the reactor, reactor pressure vessel, and nozzle connections to the reactor pressure vessel. The maximum loop pressure drop (from reactor pressure vessel outlet nozzle to inlet nozzle, not inclusive) occurs in the Foster Wheeler loops and is conservatively estimated to be 64.6 psi at a flow rate of 6.47 lb per hr. In the Babcock & Wilcox loops it is 60.4 psi for the same flow rate. The pressure drop variation with flow for this portion of the loops is compared to estimated head available from the pump. There are several areas of considerable uncertainty in pressure drop calculations involving many fittings and bends, and in all instances a reasonably conservative (high) estimate was taken for the individual component pressure drops, or a suitable safety factor was added. (auth)

12746 WAPD-PC-166
[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.]
GENERAL REQUIREMENTS FOR THE PWR NUCLEAR INSTRUMENTATION SYSTEM. W. P. DiPietro. May 20, 1955. Changed from OFFICIAL USE ONLY June 27, 1958. 11p. Contract [AT-11-1-GEN-14]. $3.30(ph OTS); $2.40(mf OTS).

The Shippingport Pressurized Water Reactor nuclear instrumentation equipment is designed for detection of the presence of neutrons, computation of neutron flux level and rate of change of the logarithm of the flux level, to provide neutron flux level and reactor period indication, and to control signals for use in other systems. (J.E.D.)

12747 WAPD-PC-263
[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.]
PWR CONTROLLED STEAM RELIEF SYSTEM STUDY. G. L. Hartfield. [Sept. 1955.] Changed from OFFICIAL USE ONLY June 27, 1958. 12p. $3.30 (ph OTS); $2.40(mf OTS).

A controlled steam relief system is necessary to permit the primary plant to remain in normal operation during large load reductions. The load changes that the primary plant can adequately handle are limited by volume surges in the pressurizer. These surges are functions of load level and load change magnitude. The primary system is provided with relief valves which are actuated by primary system pressure. A controlled steam relief system will remove the necessity for operating these valves during large load reductions. Fast reductions are 12 Mw step changes and 15 Mw ramp changes at 3%/sec. The minimum time for completely unloading the plant is probably of the order of 15 minutes. (auth)

12748 WAPD-PWR-PC-1015
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
EVALUATION OF PWR NUCLEAR INSTRUMENTATION SYSTEM SENSITIVITY AND RANGES OF OPERATION. N. E. Wilson. Sept. 20, 1957. 6p. Contract AT-11-1-Gen-14. $1.80(ph OTS); $1.80(mf OTS).

The Shippingport Reactor nuclear instrumentation system was reevaluated in accord with the latest information on predicted reactor neutron fluxes. This was interpreted through neutron detector sensitivity figures to predict meter readings under various plant conditions. The basis and method of the analysis are presented, and the results are summarized. (M.H.R.)

12749 WAPD-PWR-PC-1057
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
INTERIM REPORT OF REACTOR PROTECTION SYSTEM EVALUATION STUDY RECOMMENDATIONS. N. E. Wilson Nov. 6, 1957. 4p. Contract AT-11-1-GEN-14. $1.90(ph OTS); $1.80(mf OTS).

The Reactor Protection System interim control setting changes and operational and procedural modifications resulting from the latest accident analyses are presented. (M.H.R.)

12750 WAPD-PWR-PCR-197
[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.]
PROTECTION FOR THE SEQUENTIAL LOSS OF FLOW ACCIDENT. L. R. Halsted and N. E. Wilson. [Aug. 1956]. 7p. Contract [AT-11-1-GEN-14]. $1.80(ph OTS); $1.80(mf OTS).

The potential severity of a sequential loss of flow in the Shippingport Pressurized Water Reactor was investigated by extensive simulation of the accident. Early results show that existing core protection would be inadequate against this accident based on present ground rules. It is recommended that the reactor protection system be modified to provide for scram whenever the number of operating loops becomes less than three. (M.H.R.)

12751 WAPD-PWR-PMF-350
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
COOLANT DISCHARGE AND VENT SYSTEM; SAFETY VALVE REQUIREMENTS OF THE FLASH AND BLOW-OFF TANKS. A. P. Zechella. June 21, 1956. 5p. Contract AT-11-1-GEN-14. $1.80(ph OTS); $1.80(mf OTS).

The assumptions made in sizing the flash tank and blow-off tank safety valves are given. With these assumptions, the safety valve relieving capacity should be 6810 lb/hr for the flash tank and 82,000 lb/hr of steam for the blow-off tank. The specifications of the valves furnished are included. (M.H.R.)

12752 WAPD-PWR-PMF-999
Westinghouse Electric Corp. Bettis Atomic Power Div., Pittsburgh.
ALLOWABLE LEAK RATE FROM THE PRIMARY PLANT. W. R. Ellis. Mar. 17, 1958. 7p. PWR Project. Contract AT-11-1-GEN-14. $1.80(ph OTS); $1.80(mf OTS).

The reasons for minimizing leakage from the reactor plant are summarized. Present estimated limitations on leakage rates to various locations are given. Until significant amounts of fission products are present in the coolant, a continuous leak rate of 3 gpm exclusive of sampling flow is considered an upper limit from the standpoints of radiation exposure of personnel and of plant capabilities. (M.H.R.)

12753 WAPD-PMM-185
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
DESIGN OF AN APPARATUS FOR PILE IRRADIATION OF AQUEOUS SOLUTIONS AT HIGH TEMPERATURE AND PRESSURE WITH CIRCULATING FLOW FOR USE IN THE L 42 POSITION OF THE MTR. R. H. Giffen. Nov. 6, 1954. Decl. Apr. 15, 1957. 45p. $7.80(ph OTS); $3.30(mf OTS).

The chemical behavior of aqueous test solutions under irradiation are ascertained by chemical analyses of samples periodically withdrawn from the system. The system includes the in-pile assembly in which the solution is exposed to the pile irradiation, connecting inlet and outlet tubes, and the out-of-pile assembly consisting of a circulating pump, sample vessels, and other operating auxiliaries. Facilities are included to pressurize the solution to prevent boiling, to fill the system, and to make up volume removed as samples. The in-pile assembly constitutes a pressure vessel capable of withstanding the operating pressure of the solution, having appropriate means for desired temperatures and designed so that no damage to the reactor or operating personnel is likely to occur. (J.R.D.)

12754 WAPD-PWR-PMM-889
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
X-1 INTERIM REPORT NO. 7. T. J. Kisiel and B. Lustman. Feb. 20, 1957. 16p. Contract [AT-11-1-Gen-14]. $3.30(ph OTS); $2.40(mf OTS).

Examination of cladding from Zircaloy-2 clad fuel

rod samples tested in high-temperature water indicated that the failures resulted from excessive hydrogen pick-up. Five of nine defected samples showed either a tendency or marked indications of the same effect. Seven out of seven undefected samples from the same test showed no hydride concentration. The average hydrogen content of both defected and undefected samples irrespective of local hydriding was no greater than anticipated. It is concluded that local hydriding occurs only in defected samples. (W.D.M.)

12755 WAPD-PWR-(RD-1)-194

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
LIMITATIONS ON PWR CORE I OPERATION IMPOSED BY AN OPEN VAPOR CONTAINER. L. M. Swartz. [Nov. 1957]. 4p. Contract [AT-11-1-GEN-14]. $1.80(ph OTS); $1.80(mf OTS).

Limits are recommended for PWR operation when the vapor container is open, or the pressure integrity is unproven. It is indicated that under suitably limited power level and operating time this type of operation can be done without creating a hazard to the area. (W.D.M.)

12756 WAPD-T-624(Rev.)

[Westinghouse Electric Corp.] Bettis Plant, Pittsburgh.
RADIATION MONITORING AT THE SHIPPINGPORT ATOMIC POWER STATION. F. J. Long. [nd]. 15p. PWR Project. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

The three radiation monitoring systems, operational, safety, and radioactive waste disposal, at the Shippingport Atomic Power Station are described in general terms. (W.D.M.)

12757 WIAP-8

Westinghouse Electric Corp. Industrial Atomic Power [Group], Pittsburgh.
PROPOSED 80,000 KILOWATT PRESSURIZED WATER REACTOR PLANT. CORE DESIGN AND POWER COST ESTIMATE. Feb. 1955. Decl. June 20, 1958. 31p. $6.30(ph OTS); $3.00(mf OTS).

The proposed design of a reactor which will produce 300 Mwh for a plant which will generate 80 Mwe is presented. The mechanical design is based on a uranium–zirconium alloy rod type fuel element clad with Zircaloy. This fuel element is packaged into subassemblies which in turn are separately loaded into the core for fueling purposes. Zirconium is used as the structural material and boron steel is used as control rod material. Thermal design considerations are based on water as coolant flowing longitudinally along the fuel elements, temperature limitation in the center of the hottest fuel element and the restriction that there will be no bulk boiling in the hottest channel at the operating pressure of 2000 psi. Fuel costs are based on nuclear design considerations which specify the amount of uranium and its enrichment at the beginning and end of core lifetime and the plutonium content of the waste core. Unit cost figures are those published by the Atomic Energy Commission on January 5, 1955. (auth)

12758 YAEC-79

Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.
MONTHLY PROGRESS REPORT FOR THE PERIOD MAY 1-31, 1958. I. H. Coen and R. W. Garbe. June 20, 1958. 15p. For Yankee Atomic Electric Co. Contract AT(30-3)-222, Subcontract No. 1. $3.30(ph OTS); $2.40(mf OTS).

The status of the various development programs for the Yankee Power Reactor is outlined. No data are given. (For preceding period see YAEC-70.) (W.D.M.)

12759 AERE-Lib/Trans-774

DESIGN OF HEAVY WATER REACTORS FOR HEAT AND POWER STATIONS. P. H. Margen. Translated by M. F. Hoare (U.K.A.E.A., Atomic Energy Research Establishment) from Chem. Ing.-Tech. 29, 161(1957). 12p.

The basic principles of heavy water reactors are summarized. As an example of the economic as well as constructional problems, the Swedish planned atomic power station R3 is discussed. (A.C.)

12760

THE STATUS OF NUCLEAR DATA FOR REACTORS. P. A. Egelstaff (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Atomics and Nuclear Energy 9, 204-7(1958) June.

Some of the economic problems in current nuclear data works and the techniques involved are discussed. (auth)

12761

DENSITY OF AN AQUEOUS VAPOR MIXTURE FORMED IN A VESSEL WITH HOT WATER UNDER REDUCED PRESSURE. V. K. Zavoiskii, V. N. Vorob'ev, and R. L. Serdyuk. Atomnaya Energiya 4, 285-6(1958) Mar. (In Russian)

Experiments were made to determine the aqueous vapor density in transition processes connected with rapidly reduced pressures in the active zone of a water moderated reactor. The scheme of the experimental apparatus is presented. (R.V.J.)

12762

NUCLEAR ROCKETS: BASIC PRINCIPLES. Jerry Grey (Princeton Univ., N. J.). Nucleonics 16, No. 7, 62-5(1958) July.

A comparison is made of the nuclear and chemical rockets with respect to attainable velocity and dead weight. In single-stage rockets it is shown that the nuclear rocket is superior to the chemical rocket for satellite and escape missions. For large payloads (over 10 tons) it is superior for all missions. In multistage rockets it is concluded that the nuclear rocket will outperform any chemical system in carrying large payloads on high-burnout-velocity missions. (J.S.R.)

12763

NUCLEAR ROCKETS: ROCKET-REACTOR DESIGN. Myron M. Levoy and John J. Newgard (Thiokol Chemical Corp., Denville, N. J.). Nucleonics 16, No. 7, 66-8 (1958) July.

Although reactors for rocket propulsion will need to operate at power densities much higher than those of conventional power reactors, the rocket reactor has to run at full capacity for periods of only a few minutes. For the first design a straight-forward solid-fuel element reactor in which H_2 gas is heated at the propellant seems the wisest choice. A reactor system is also needed with enough thermal neutrons to give a reasonable excess reactivity. The fuel element design, core design, and reactor control for this reactor system are discussed. The nozzle and chamber designs are briefly considered. (J.S.R.)

12764

NUCLEAR ROCKETS: LOS ALAMOS' PROJECT ROVER. Raemer E. Schreiber (Los Alamos Scientific Lab., N. Mex.). Nucleonics 16, No. 7, 70-2(1958) July.

Although design comparisons have shown that the solid-fuel-reactor rocket system compares favorably with the best that chemical systems can do, the designs show many uncertainties in solid-reactor-material temperature limitations and convective heat transfer.

Project Rover is designed to combine some general research with a specific development program for the design, fabrication, and operation of experimental rocket reactors. The high power density and large range of operating temperatures demand large rapid changes in reactivity and so necessitate a remote test area. The test installation of the Kiwi-A (the first experimental test device for possible rocket use) is described, as well as the supporting facilities. (J.S.R.)

12765

NUCLEAR ROCKETS: BEYOND TOMORROW. Nucleonics 16, No. 7, 73-5(1958) July.

Possible lines of development for rocket propulsion in the future are discussed. Gaseous reactors, fusion propulsion, and ion propulsion are briefly considered, and the development problems presented by each are reviewed. (J.S.R.)

12766

BLENDING VERSUS RE-ENRICHMENT. Donald Kallman and John E. Brennan (Babcock and Wilcox Co., New York). Nucleonics 16, No. 7, 101(1958) July.

Burned-out fuel from a slightly enriched reactor can either be returned to the diffusion plant to be re-enriched or it can be blended with highly enriched U to obtain the desired enrichment. A cost analysis, using the A.E.C.'s enriched U price scale, shows that blending is slightly more expensive than re-enrichment. However, the advantages of using partially decontaminated spent fuel are likely to cause blending to be preferred. (J.S.R.)

12767

NUCLEAR POWER PLANTS IN U.S.S.R. E. P. Anan'ev. Vestnik Akad. Nauk S.S.S.R. 28, No. 3, 1-14(1958) Mar. (In Russian)

The design and performance of a water moderated reactor is described, and diagrams of power plants powered by graphite moderated, boiling water, and fast reactors are presented. Analysis is made of the performance and economic factors of the various reactor types. (R.V.J.)

12768

CONTROL SYSTEM ON A TURBINE GENERATOR SUPPLYING COMMERCIAL POWER AS BY-PRODUCT OF A NUCLEAR TEST REACTOR. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 33, Session 14. H. W. Bassett, Jr. and E. R. Gasser (Knolls Atomic Power Lab., Schenectady, N. Y.). New York, American Institute of Chemical Engineers, 1958. 12p.

The control system of the 12,500-kw steam turbine generator installed to use the excess steam produced in the submarine prototype reactor at West Milton, N. Y., is described. The turbine can be controlled and operated independently of the reactor test plant. (W.D.M.)

12769

DESIGN AND DESCRIPTION OF AN ENRICHED URANIUM NEUTRON FLUX CONVERTER. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 57, Session 32. R. Anliot, R. Uyetani, R. D. Shelton, and A. R. Rana (Admiral Corp., Chicago). New York, American Institute of Chemical Engineers, 1958. 13p.

A device to obtain fission neutrons by irradiating U^{235} with thermal neutrons is described. This device, called a flux converter, will be used in the thermal column of the CP-5 reactor at Argonne. The converter will contain 168 grams of U^{235} in a box-like arrangement of fuel plates which will be cooled by a closed loop circulating water system. At 4 megawatt reactor power, the thermal flux at the plates will be about 4×10^{12} and the total emission rate of the plates will be about 2×10^{15} fission neutrons per second. A maximum fast flux of approximately 10^{11} neutrons/cm^2/sec is expected within the irradiation space of 2 cubic foot volume. (auth)

12770

NUCLEAR PROBLEMS ASSOCIATED WITH PLUTONIUM FUEL CYCLES AND WITH THE EXPERIMENTAL REACTOR. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 125, Session 13. J. R. Triplett (General Electric Co.). New York, American Institute of Chemical Engineers, 1958. 10p.

The use of plutonium as a reactor fuel imposes problems not present with U^{235}. The effects of certain variables on the self-sustaining cycle as well as on the design of the test reactors are discussed. (auth)

12771

INSPECTION AND TESTING OF PRESSURE PIPING AS RELATED TO NUCLEAR POWER PLANTS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 132, Session 3. V. T. Malcolm and Sidney Low (Chapman Valve Mfg. Co.). New York, American Institute of Chemical Engineers, 1958. 42p.

The progress being made in nuclear power plants has accelerated efforts to obtain standard practices because it is recognized that the requirements set forth in present codes have not yet attained adequate structure for nuclear power piping systems; the fabrication requirements are not meaningful and inspection standards are lacking. The specific field of pressure piping with which this paper deals has benefited from and progressed with pressure vessels to which it is assembled. The code for pressure piping assumes the status of an enforcement code and brings to an end the long held opinion that piping offers only an insignificant hazard. Consequently, the ASA code for pressure piping recognized these facts and their decisions have resulted in the formation of an advisory committee on nuclear power piping. (A.C.)

12772

COOLANT TEMPERATURE RISE IN A PRESSURIZED WATER REACTOR DURING A LOSS OF FLOW INCIDENT. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 137, Session 33. J. Weisman, S. Bartnoff, and G. G. Tirellis (Westinghouse Electric Corp., Pittsburgh). New York, American Institute of Chemical Engineers, 1958. 22p.

A method is described for calculating the coolant temperature at the reactor outlet as a function of time following a loss of pumping power and the consequent loss of coolant flow. The effects of negative temperature coefficient and delayed gamma radiation on the heat production rate of the reactor are considered. Contributions to the total coolant temperature rise are calculated from both the nucleate boiling region and the non-nucleate boiling region of the core. Computations are made of the time required for bulk boiling to occur at the reactor outlet and at the outlet of the hot channel. (auth)

12773

CONTROL OF THE PRPR—A GAS BALANCE METHOD WITH SUPPLEMENTARY MECHANICAL SHIMS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958.

Preprint 138, Session 30. J. F. Fletcher (General Electric Co., Richland, Wash.). New York, American Institute of Chemical Engineers, 1958. 15p.

The control system of the PRP reactor provides an unusual degree of reactor safety combined with simplicity and flexibility of reactor operation. The methods of control employed in the PRP reactor are described and the basic control characteristics of the system are discussed. Unusual problems associated with the mechanical shim design are described. A brief analysis of response of the reactor safety system is given. (auth)

12774

REPROCESSING URANIUM–ZIRCONIUM ALLOY REACTOR FUEL ELEMENTS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 139, Session 37. C. B. Leek, R. B. Lemon, and F. K. Wrigley (Phillips Petroleum Co., Idaho Falls, Idaho). New York, American Institute of Chemical Engineers, 1958. 22p.

The process employed for the recovery of uranium from uranium–zirconium alloy reactor fuel elements at the Atomic Energy Commission's Idaho Chemical Processing Plant is described and the results of the initial processing and decontamination operations summarized. (auth)

12775

A STUDY OF THE FEASIBILITY OF A TRACER SYSTEM FOR LOCATING A FUEL-ELEMENT FAILURE IN A PRESSURIZED WATER REACTOR. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 140, Session 31. Meyer Pobereskin, Duane N. Sunderman, Aaron Eldridge, George D. Calkins, and Walston Chubb (Battelle Memorial Inst., Columbus, Ohio). New York, American Institute of Chemical Engineers, 1958. 31p.

The results of this investigation indicated that a system of tracer elements for location of fuel-element failure merited further development. The proposed method consists in adding very small amounts of different pairs of elements to the fuel alloy of each subassembly. In most cases this is less than 0.1 w/o. These elements become activated during operation of the reactor, producing radioisotopes. When a fuel-element failure has occurred, a portion of the coolant is analyzed radiochemically for the elements added to the fuel as tracers. The radioactive species of the elements that are detected indicate the subassembly in which the failure has occurred. The elements which were found to be suitable tracers were erbium, gallium, holmium, iridium, osmium, platinum, rhenium, scandium, terbium, thulium, and ytterbium. Radiochemical separation procedures were developed for these elements and checked out on irradiated alloy specimens. Using reactor coolant water, it was determined that the tracer elements did not already exist in the coolant. Metallurgical studies indicated that fuel alloy could be prepared with the tracer elements. The physical properties, particularly hardness, ductility, and corrosion resistance, of the tracer fuel alloys were similar to those of fuel alloy without tracers. (auth)

12776

CONTROL VALVES FOR THE HOMOGENEOUS REACTOR TEST. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 149, Session 6. A. M. Billings (Oak Ridge National Lab., Tenn.). New York, American Institute of Chemical Engineers, 1958. 15p.

Bellows-sealed control valves for the Homogeneous Reactor Test, the second experimental aqueous homogeneous reactor to be constructed under the program of the United States Atomic Energy Commission for the evaluation of nuclear power reactors, are described. Since temperature and power level must be controlled by valves which regulate fuel concentration and steam withdrawal from the heat exchangers, specification and design were governed primarily by the need for reliability. (auth)

12777

STEAM GENERATOR INSTRUMENTATION FOR A NUCLEAR POWER PLANT WITH ANALOG COMPUTER VERIFICATION OF DYNAMIC ACTION. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 163, Session 17. E. E. Lynch and D. P. Waite (General Electric Co., West Lynn, Mass.). New York, American Institute of Chemical Engineers, 1958. 31p.

High performance nuclear reactor designs of the pressurized water type are used with smaller than conventional steam drums to convert from primary coolant heat to steam in a heat exchanger. "Swell" caused by steam bubbles raising the liquid level various amounts at different steam generation levels poses an acute feedwater control problem. A solution to such a problem is discussed. The method of studying feasible solutions and the use of a computer setup which eventually includes newly developed physical equipment replacing the initial simulated measurement components is traced. Performance data with actual electrical control initiation with various degrees of proportional and reset action is shown as it operates an electrical valve operator to control a simulated feedwater flow. A comprehensive system study was found desirable to aid in the system design and component development of steam generator instrumentation for a nuclear power plant. This paper illustrates some of the problems and solutions associated with such a program. The term "steam generator instrumentation" as used in this paper is intended to mean the major instrumentation used to control the performance of the steam generator in supplying suitable quality steam to meet power requirements. With small steam drums used for space economy in nuclear submarines, the problem is not one of simple liquid level regulation or of straightforward feedwater flow control. Variations in level must be programmed and changes in feedwater flow must not adversely upset the thermal equilibrium of the reactor coolant since the reactor power level depends on the moderating properties of the coolant and the moderating properties are a function of the coolant temperature. Moreover, subcooled feedwater entering the steam drum as shown in figure 1 can alter the flow through the downcomer and this is an important factor in determining optimum operation of feedwater control valves. (auth)

12778

MAIN COOLANT INSTRUMENTATION FOR HIGH PERFORMANCE PRESSURIZED WATER REACTOR POWER PLANTS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 174, Session 17. Leroy C. Noyes (General Electric Co., West Lynn, Mass.). New York, American Institute of Chemical Engineers, 1958. 31p.

A brief resume of the design requirements for pressurized water reactor temperature, pressure, flow and liquid level instrumentation is discussed. The goals to be met by the development are followed in logical order

by a discussion of the means chosen to achieve them. Because the primary use of high performance pressurized water reactors at the present time is for ship propulsion, the requirements for reliability and long life under vibration and high shock have forced the evolution of self-balancing magnetic amplifier circuits for process-type measurements as well as new detector designs. Performance data are presented on the measurement set errors. (auth)

12779

ABSORBER MATERIALS FOR REACTOR CONTROL. W. Kermit Anderson and Donald N. Dunning (General Electric Co., Schenectady, N. Y.). Paper No. 57-NESC-66 of 2nd Nuclear Engineering and Science Conference, March 11-14, 1957, Philadelphia, Penna. New York, The American Society of Mechanical Engineers, 1957. 7p.

Control of reactors based on movable poisons is discussed. The control materials boron, hafnium, gadolinium, and europium are evaluated. (W.D.M.)

12780

POWER REACTORS. Washington, Atomic Energy Commission, 1958. 96p. Available from U. S. Government Printing Office, Washington for $0.65.

A compact summary of technical information on 10 full-scale power plants built, under construction, or being undertaken in the U. S. is presented. These represent six different types of reactors: pressurized water, boiling water, sodium graphite, organic moderated, fast breeder, and sodium heavy-water. Sketches and pertinent data are given for each of the 10 power plants. The Consolidated Edison Thorium Reactor (Indian Point Power Reactor) is a pressurized-water uranium-thorium 275 Mwe plant. The Yankee Power Reactor is a 134 Mwe, pressurized-water, UO_2-fueled plant. The Army Package Power Reactor is a 2 Mwe pressurized-water reactor. The Vallecitos Boiling Water Reactor is a 6 Mwe, UO_2-fueled plant. The Dresden Power Reactor is a 180 Mwe, UO_2-fueled, boiling water reactor. The Northern States Nuclear Power Plant (Sioux Falls Power Reactor) is a 66 Mwe UO_2-fueled, boiling water reactor. The Hallam Power Reactor is a 75 Mwe, sodium-cooled, graphite-moderated, enriched uranium reactor. The Organic Moderated Reactor Power Plant (Piqua Power Reactor) is a 12.5 Mwe, organic moderated and cooled, enriched uranium reactor. The Fermi Fast Breeder Reactor is a 90 Mwe, sodium cooled, enriched uranium reactor. The Chugach Power Reactor is a 10 Mwe, sodium cooled, heavy water moderated, enriched uranium reactor. (M.H.R.)

12781

REACTOR CORE MATERIALS. Technical Progress Review, Vol. 1, No. 2. Columbus, Battelle Memorial Institute, 1958. 47p. Available from U. S. Government Printing Office, Washington for $0.55.

The second of a series of quarterly publications covering significant developments in the field of solid reactor core materials is presented. It is a compilation of reviews of specialized topics. The purpose of the review series is to provide a convenient condensed source of information. Complete bibliographies are provided at the end of each section. Coverage is limited to those core materials which are solid at reactor operating temperatures. Fuel and fertile materials, moderator materials, control materials, cladding and structural materials, and special fabrication techniques are considered. (W.D.M.)

Nuclear Transformation

12782 AECU-3513

Michigan. Univ., Ann Arbor.

ABSOLUTE (d,α) REACTION CROSS SECTIONS AND EXCITATION FUNCTIONS. Oswald U. Anders. Apr. 26, 1957. 269p. Project No. 7. Contract AT(11-1)-70. $6.00(OTS).

The purpose of this research was the determination of the cross sections of various (d,α) reactions induced by the 7.78 ± 0.05 Mev deuterons from the University of Michigan cyclotron. Special emphasis was given to reactions involving closed-shell nuclei as target isotopes. Experimental techniques were refined to permit precision measurement of the cross section values. The investigation involved the bombardment of thin targets of metallic zirconium, molybdenum, and titanium as well as of zinc sulfide, subsequent chemical separation of the product nuclei, identification of the products by x-ray and γ spectroscopy, and determination of the absolute disintegration rates of β- and x-ray emitting isotopes. The instruments constructed during this research included: a current integrator permitting measurement of the intensity of the cyclotron beam with 1% error; two 4π β-ray proportional counters; a 4-in.-diam. x-ray proportional counter filled with krypton at two atmospheres pressure; and a beta thickness gage for thin films. Procedures were developed to calibrate the current integrator, to determine, with an accuracy of 1%, the evenness of target foils by a non-destructive method, to prepare cyclotron targets of materials sublimating below 1500°C by high vacuum evaporation, to purify various reaction products by using carrier-free chemical separations with decontamination factors of 10^5 and better. Methods were devised to determine the yield of the chemical separations with radioactive tracers, to identify various isotopes by their γ and x-ray spectra, to count absolutely x rays and β rays with proportional counters as well as with coincidence set-up, and to prepare thin films used for mounting the 4π counter samples. (auth)

12783 ANU/P-185

Australian National Univ. Research School of Physical Sciences, Canberra.

THE PHOTODISINTEGRATION OF POTASSIUM BY Li^7(p,γ) RADIATION. T. R. Ophel. [1958]. 8p.

The proton spectrum of the reaction K^{39}(γ,p) was obtained at 17.6 Mev. Transitions to known levels in Ar^{38} at 2.16 and 3.75 Mev were identified and proton groups of energies as low as 2 Mev were resolved, corresponding to levels in Ar^{38} at 4.3, 5.0, 5.4, 6.3, 6.6, 7.3, and 7.85 Mev. The total (γ,p) cross section for the reaction at 17.6 Mev is found to be in excess of 11 mb. (auth)

12784 ORNL-2535

Oak Ridge National Lab., Tenn.

NUCLEAR REACTION CROSS SECTIONS FROM THE NITROGEN BOMBARDMENT OF SULFUR. D. E. Fisher. July 29, 1958. 72p. Contract W-7405-eng-26. $2.00(OTS).

The main assumption of the compound nucleus model is that the nuclear reaction can be divided into two states—the formation of a compound nucleus and its subsequent decay—and that these two stages are independent of each other. Experiments testing the statistical theory of compound nucleus decay may deal with reaction cross sections. Natural S was bombarded with N ions at incident energies from 20 to 28 Mev. At the

latter energy the V^{46} compound nucleus is excited to 33.3 Mev. Four nuclear reactions initiated by the N bombardment of natural S were experimentally observed, excitation functions were measured, and the cross sections of three of these at a bombarding energy of 27 Mev were compared with predictions based on the statistical theory of compound nucleus decay. The predictions of the statistical theory were calculated. Good agreement with theory was obtained for the (N^{14},p) and $(N^{14},2p)$ reactions in view of the approximations necessary. The predicted value of the $(N^{14},2\alpha)$ reaction was at least four times less than the experimental value. (M.H.R.)

12785 UCRL-8223

California. Univ., Berkeley. Radiation Lab. SPALLATION AND FISSION IN THORIUM-232 AND THE MASSES OF THE HEAVIEST ELEMENTS (thesis). Bruce Milburn Foreman, Jr. Apr. 1958. 107p. Contract W-7405-eng-48. $16.80(ph OTS); $5.70(mf OTS).

In Part One is reported a series of experiments to measure mass yield curves for fission and excitation functions for spallation reactions induced in Th^{232} by helium ions of energy 15 to 46 Mev. The fission yield curves show the usual double-humped shape indicating asymmetric fission, becoming more symmetric as bombarding energy is increased. The $(\alpha,4n)$ and fission reactions can be understood in terms of the compound-nucleus theory of nuclear reactions. The (α,p), (α,pn), $(\alpha,p2n)$, $(\alpha,p3n)$, $(\alpha,2p)$, $(\alpha,2pn)$, and $(\alpha,\alpha n)$ excitation functions are discussed in terms of a mechanism in which one charged particle is emitted in a direct interaction, followed by the evaporation of a small number of neutrons. In Part Two, the masses of the isotopes of the heaviest elements are calculated from known decay data in the region. The data are extended by means of decay energies calculated from closed decay-energy cycles and some are estimated from the systematics of alpha- and beta-decay energies. The absolute values of the masses are based on the mass-spectrometrically determined mass of Pb^{208} and a few measured neutron binding energies. The half-life systematics of alpha decay and spontaneous fission are also presented and some predictions are made of the properties of as yet undiscovered nuclides. (auth)

12786

THE ENERGY AND ANGULAR DISTRIBUTIONS OF THE PROTONS FROM THE REACTION $^{60}Ni(n,p)^{60}Co$ INDUCED BY 13.5 Mev NEUTRONS. P. V. March and W. T. Morton (Univ. of Glasgow). Phil. Mag. (8) 3, 577-81(1958) June.

The energy spectrum and angular distribution of the protons emitted from Ni^{60} on bombardment with 13.5-Mev neutrons have been studied using photographic emulsions. About 30% of the protons emitted can be attributed to direct interaction processes. (auth)

12787

CROSS SECTION FOR THE $Al^{27}(\gamma,2p)Na^{25}$ REACTION TO 65 Mev. L. B. Aull and W. D. Whitehead (Univ. of Virginia, Charlottesville). Phys. Rev. 110, 1113-15 (1958) June 1.

The $Al^{27}(\gamma,2p)Na^{25}$ cross section has been determined from 25 to 65 Mev with respect to the $Cu^{63}(\gamma,n)Cu^{62}$ cross section. The cross section has a maximum value of 0.29 mb at 32 Mev, and the integrated cross section from 25 to 64 Mev is 2.8 Mev mb. (auth)

12788

PHOTONEUTRON REACTIONS IN LITHIUM. T. W. Rybka and L. Katz (Univ. of Saskatchewan, Saskatoon, Can.). Phys. Rev. 110, 1123-6(1958) June 1.

The photoneutron cross section for the (γ,n) reaction in natural lithium was measured and found to have its maximum at 16.8 Mev, a peak value of 2.3 mb, and a width at half maximum of 9.3 Mev. Fine structure in the region to 10 Mev was resolved as follows: $Li^6(\gamma,np)He^4$ threshold at 3.61 ± 0.15 Mev, $Li^6(\gamma,p)He^5$ threshold at 4.64 ± 0.08 Mev, a level in Li^6 at 5.24 ± 0.05 Mev, $Li^6(\gamma,n)Li^5$ threshold at 5.73 ± 0.05 Mev, $Li^7(\gamma,n)Li^6$ threshold at 7.30 ± 0.04 Mev, and a level in Li^7 at 9.66 ± 0.04 Mev. (auth)

12789

PRODUCTION OF F^{18} AND Na^{24} IN IRRADIATIONS OF VARIOUS TARGETS WITH PROTONS BETWEEN 1 AND 6 Bev. A. A. Caretto (Brookhaven National Lab., Upton, N. Y. and Univ. of California, Berkeley) and J. Hudis and G. Friedlander (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 110, 1130-3(1958) June 1.

Cross sections are reported for the formation of Na^{24} and F^{18} in the interaction of Cu, Ag, Ta, Au, Pb, and U with protons of several energies between 1 and 6 Bev. The cross sections all increase with increasing energy. At each energy the cross sections go through a minimum when plotted against target mass number. The data are interpreted in terms of a spallation mechanism for Cu and Ag targets, with some contribution from fission especially in the case of Ag, and in terms of a fragmentation process for the heavy-element targets. (auth)

12790

CORRELATED NEUTRON-PROTON PAIRS FROM THE HIGH-ENERGY PHOTODISINTEGRATION OF HELIUM AND LITHIUM. M. Q. Barton and J. H. Smith (Univ. of Illinois, Urbana). Phys. Rev. 110, 1143-55(1958) June 1.

Observations are made on the protons and neutrons simultaneously ejected from helium and lithium by 280 Mev bremsstrahlung. All photoprotons are found to be accompanied by a neutron. The results are interpreted in terms of Levinger's quasideuteron theory of photodisintegration. The results lead to a measurement of the low momentum spectrum in helium and lithium as well as identification of the high-momentum components of the momentum spectrum as due to two-particle interactions. (auth)

12791

(p,pn) AND (p,2p) REACTIONS OF Ce^{142} AT PROTON ENERGIES FROM 0.4 TO 3.0 Bev. A. A. Caretto and G. Friedlander (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 110, 1169-73(1958) June 1.

Cross sections are reported for (p,pn) and (p,2p) reactions of Ce^{142} with protons of 0.4, 1.0, 2.2, and 3.0 Bev. To evaluate the contribution of proton and neutron evaporation from excited Ce^{142} nuclei to the observed cross sections, this evaporation competition was studied by means of cross-section measurements on the reactions $Ba^{138}(\alpha,n)$ and $Ba^{138}(\alpha,p)$ with α particles of 19- to 40-Mev kinetic energy. The ratio $\sigma_{\alpha,n}/\sigma_{\alpha,p}$ is between 2.4 and 4.4 in this region as compared with a ratio of 1.58 ± 0.14 for $\sigma_{p,pn}/\sigma_{p,2p}$ at 0.4 Bev. It is concluded that at this energy the (p,pn) and (p,2p) reactions proceed at least partially by a pure knock-on mechanism. This conclusion is supported by comparison of the data with recent Monte Carlo calculations of intranuclear cascades. With increasing proton energy both $\sigma_{p,2p}$ and $\sigma_{p,pn}$ are found to decrease, the former more rapidly than the latter. This energy dependence is discussed in terms of the elementary nucleon-nucleon cross sections. The Monte Carlo calculations mentioned agree within their rather poor statistical accuracy with the measured

cross-section ratios and with the energy dependence of the cross sections, but predict cross-section values about a factor of three too small. (auth)

12792

SINGLE-PARTICLE INTERPRETATION OF PROTON SPECTRA FROM (d,p) REACTIONS. J. P. Schiffer, L. L. Lee, Jr., J. L. Yntema, and B. Zeidman (Argonne National Lab., Lemont, Ill.). Phys. Rev. 110, 1216-18 (1958) June 1.

The spectrum of protons from a (d,p) reaction has been studied with deliberately poor resolution. It is hoped to see whether any regularities in the gross features of the spectrum of protons emitted in (d,p) reactions could be found when several neighboring elements were studied and to see to what extent these regularities depended on bombarding energy. (A.C.)

12793

NEW ISOTOPE OF BERYLLIUM. M. J. Nurmia and R. W. Fink (Univ. of Arkansas, Fayetteville). Phys. Rev. Letters 1, 23-4(1958) July 1.

Several samples of B_4C, BN, B_2O_3, and elemental boran of natural isotopic composition were irradiated with a flux of 10^8 to 10^9 14.8-Mev neutrons/cm^2 sec. A 14.1-sec activity which was not previously reported is assigned tentatively to a new isotope, Be^{11}, from the $B^{11}(n,p)$ reaction. (M.H.R.)

12794

GAMMA-RAY SPECTRA FROM NEUTRON CAPTURE IN RESONANCES OF Mn^{55}. T. J. Kennett, L. M. Bollinger, and R. T. Carpenter (Argonne National Lab., Lemont, Ill.). Phys. Rev. Letters 1, 76-7(1958) July 15.

The Argonne fast chopper was used to select the energy of the incident neutrons on the basis of their time of flight. The gamma-ray spectra resulting from capture of these timed neutrons by Mn^{55} were measured with two 4-in. NaI(Tl) scintillators using a fast-slow coincidence technique. The gamma-ray coincidence spectra associated with capture in the resonances at 337, 1080, and 2360 ev were determined. An extensive investigation of the low-lying excited state of Mn^{56} was made by means of coincidence measurements on the gamma rays following capture of thermal neutrons. (W.D.M.)

12795

CONVERSION OF L II AND L III ELECTRONS WITH EMISSION OF E1-QUANTUM IN E0 NUCLEAR TRANSITIONS. D. P. Grechukhin (Academy of Sciences, USSR). Soviet Phys. JETP 6, 797-8(1958) Apr.

The probability for the conversion of L II and L III electrons is considered in which the electron, emitting a dipole quantum (E1), changes to a state with momentum $j = 1/2$, $l = 0$ and then converts in the E0 nuclear transition. The results of the calculations are given. (J.S.R.)

12796

A RADIOCHEMICAL INVESTIGATION OF THE REACTION $Si^{30}(p,\pi^+)Si^{31}$. S. Sekerskii and A. K. Lavrukhina (V. I. Vernadskii Inst. of Geochemistry and Analytic Chemistry, Academy of Sciences, USSR and Nuclear Research Inst., Polish Academy of Sciences). Soviet Phys. (Doklady) 2, 487-9(1957) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 6223.

Particle Accelerators

12797 AECU-3754

Stanford Univ., Calif. Microwave Lab.

TRANSIENT BEAM LOADING IN LINEAR ELECTRON ACCELERATORS. Richard B. Neal. May 1957. 17p. Contract AT(04-3)-21. (ML-388). $3.30(ph OTS); $2.40(mf OTS).

Accelerators designed for heavy beam loading where emphasis has been placed upon obtaining high electron energy rather than high current or high efficiency are discussed. With suitable design it is possible to place the equilibrium electron phase angle well ahead of the crest of the traveling wave in the accelerator. With beam loading the equilibrium position will move toward the crest, but the electron energy will remain constant or nearly so over a considerable range of loading. Some loss in energy will result from moving the equilibrium phase angle off the wave crest, but the spread in energies due to beam loading should be reduced. (J.E.D.)

12798 AERE-T/R-2519

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

PRODUCTION OF HIGH DENSITY PROTON CURRENTS FOR COLLIDING BEAM ACCELERATORS AT 15 GeV. J. W. Burren, D. Morgan, and W. Walkinshaw. Mar. 1958. 41p. $1.08(BIS).

A head-on collision of two 15-Bev protons produces an energy in the center of mass equivalent to about 500 Bev with the target at rest. To achieve significant production of secondaries, intense beams of particles are required, and this is obtained by 'stacking' successive pulses of particles at high energy. Limitations imposed by the accelerating system are examined, and upper limits are given to the densities that can be obtained under different assumptions. (auth)

12799 ANL-5864

Argonne National Lab. Lemont, Ill.

PARTICLE ACCELERATOR DIVISION SUMMARY REPORT [FOR] OCTOBER 1, 1957 THROUGH APRIL 15, 1958. 63p. Contract W-31-109-eng-38. $1.75(OTS).

Theoretical studies of the ANL 12.5-Bev synchrotron are presented. Detailed studies have been made on the straight one-seventh scale model, where changes in hole size and position can be made with relative ease. Several tests were made to check the operation of the analog-to-digital converter. Generator regulation is discussed. Comparative analysis of a number of schemes for ring magnet power supply are in progress. Calculations have been made of the forces expected on the various components of the synchrotron. Ring magnet and ring magnet coil design progress is reported. Studies of the r-f accelerating voltage are described. The design of the 50-Mev BNL linear accelerator has been adapted for use in the synchrotron. Initial design studies were completed for the 124 quadrupole magnets for the linear accelerator. The injection system for the ANL synchrotron will consist of an ion source, a 750-kv preaccelerator, and a 50-Mev linear accelerator. The acceleration of proton beams is being studied. Epoxy plastics were studied to obtain their vacuum, radiation damage, and bonding properties. Recommendations for the layout of experimental areas, the power requirements for these areas, and the characteristics of the various beams are presented. (For preceding period see ANL-5803.) (W.D.M.)

12800 CERN-58-5

European Organization for Nuclear Research, Geneva.

STUDY OF TWO-DIMENSIONAL NON-LINEAR OSCILLATIONS BY MEANS OF AN ELECTROMECHANICAL ANALOGUE MODEL, APPLIED TO PARTICLE MOTION IN CIRCULAR ACCELERATORS. M. Barbier and A. Schech. Apr. 15, 1958. 31p.

The transverse motion of a particle in an accelerator is simulated by a two-dimensional pendulum. Non-linear forces and perturbations are simulated by electrostatic fields which, obeying Laplace's equation, make it easy to produce the particular spatial configurations of forces and perturbations occurring in the guide field accelerators. Details on the performance of the analog are given as well as results of further experiments on non-linear resonances (with fixed parameters). (M.H.R.)

12801 CERN-58-9
European Organization for Nuclear Research, Geneva. THEORY OF R.F. ACCELERATION IN FIXED FIELD CIRCULAR ACCELERATORS. Consequences of the Energy Oscillations of Phase Instable Particles. The Occurrence of Buckets in Multiple Gap Accelerators. Nils Vogt-Nilsen. Apr. 1958. 46p.

Report No. 5 of Study Programme on Beam Stacking Processes.

The concept of moving buckets containing those trajectories on the (4,y) phase cylinder that are representative of particles which are phase stable with respect to some specific subharmonic of the accelerating gap voltage is discussed. If the buckets are to be used for stacking particles at a given energy level in the accelerator, then the phase unstable trajectories outside the bucket become as important as the phase stable ones inside. The reason is that the already stacked particles will find themselves outside the oncoming buckets, and will be influenced in such a way as to increase the energy spread among the stacked particles in proportion to the number of buckets used in the stacking process. In certain unfavorable cases one may even expect heavy losses of stacked particles as a consequence of a resonance between their betatron oscillations and the oscillations which are executed due to the presence of a nearby bucket (r-f knockout). Even the phase stable particles trapped inside a certain bucket may simultaneously be affected also by these. The order of magnitude of this effect, which is actually the error introduced by the approximations involved in the basic equations, may be calculated. This allows a statement on the limit of applicability of the Bucket Theory to be made. (M.H.R.)

12802 CERN-58-10
European Organization for Nuclear Research, Geneva. THEORY OF R.F. ACCELERATION IN FIXED FIELD CIRCULAR ACCELERATORS. The Effect of Radially Varying Accelerating Gap-voltages on the Synchrotron Oscillations. Nils Vogt-Nilsen. May 12, 1958. 7p.

Report No. 6 on Study Programme on Beam Stacking Processes.

It has been pointed out by Walkinshaw that the effect of a radially varying accelerating gap voltage amplitude, as far as the theory of r-f acceleration of charged particles in fixed field circular accelerators is concerned, may be taken into account simply by making the appropriate choice of canonical variables to describe the motion. The basic equations of motion in a single gap machine are derived as previously done, with the exception that now the gap voltage amplitude shall contain a radially dependent factor. Walkinshaw's theory is outlined. (M.H.R.)

12803 CERN-58-12
European Organization for Nuclear Research, Geneva. TRANSVERSE VARIATION OF ACCELERATING FORCE. H. G. Hereward. June 1958. 9p.

An expression for the transverse variation of accelerating force for a particle crossing a gap is derived. Its application to linear accelerators and synchrotrons is discussed. (W.D.M.)

12804 UCRL-3070
California. Univ., Berkeley. Radiation Lab. BEVATRON MAGNET POWER SUPPLY TRANSIENT STRESSES IN THE BEVATRON 50,000-kva MOTOR GENERATOR. D. T. Scalise. July 27, 1955. 9p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

The problem of transient torsional stresses in the drive shafts of the Bevatron 50,000 kva motor generators was investigated on a theoretical basis, and the results indicate that the stress reaches 9,000 psi. (W.D.M.)

12805 AEC-tr-3247
CYCLOTRON ION SOURCE FOR THE PRODUCTION OF MULTIPLY CHARGED NITROGEN IONS. P. M. Morozov (Morosov), B. N. Makov, and M. S. Ioffe. Translated by Lydia Venters (Argonne National Lab.) from Atomnaya Energ. 2, 272-4(1957). 15p.

A cyclotron ion source for production of N^{5+} ions is described. The ion source consists of a gas discharging chamber-anode, preheating cathode, and reflector. The slit of the gas discharging chamber is 10×10 mm in cross section, the chamber length is 100 mm. (W.D.M.)

12806 AEC-tr-3283
A METHOD FOR OBTAINING MOLECULAR BEAMS. D. L. Simonenko. Translated by Lydia Venters (Argonne National Lab.) from Zhur. Ekspti'. i Teoret. Fiz. 20, 385-9(1950). 10p.

A method for obtaining molecular beams is described which is based on the neutralization of the ion beams by means of intense electron fluxes directed perpendicular to the emission direction of the ion beam. The possibility of obtaining intense and monochromatic molecular beams is proved. The velocity of the molecules of the beam changes within large limits due to the alteration of the accelerating potential in the ion source. (W.D.M.)

12807 AERE-Lib/Trans-675
APPARATUS FOR A PULSED SUPPLY TO MODEL 5 AND SUBSEQUENT MODELS. Translated by S. Fitzgerald (U.K.A.E.A., Atomic Energy Research Establishment) from Report CERN-PB/MM-14, Feb. 1955. 22p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 9, as abstract No. 5162.

12808
DESIGN OF LINEAR ELECTRON ACCELERATORS WITH BEAM LOADING. Richard B. Neal (Stanford Univ., Calif.). J. Appl. Phys. 29, 1019-24(1958) July.

The optimum design of linear electron accelerators depends upon the degree of beam loading, i.e., the fraction of the radio-frequency power which is converted into beam power. With very light loading, the product of the radio-frequency attenuation constant I, and the accelerator length L should be approximately 1.26 for maximum beam energy in a given length. For heavier loading the product IL must be reduced to produce maximum conversion efficiency from radio-frequency power to electron beam power. The attenuation constant I can be chosen by the proper selection of the dimensions of the accelerating structure. Expressions and design curves are given for the optimum values of IL to maximize electron beam energy and electron beam power as a function of beam loading. (auth)

12809
THE CYCLOTRON OF THE ECOLE SUPERIEURE DE PHYSIQUE ET DE CHEMIE OF PARIS. M. G. Dupuy.

J. phys. radium 19, Suppl. No. 4, 27A-34A(1958) Apr. (In French)

A small educational cyclotron capable of accelerating protons to 600.000 ev at 6 μa is described in detail. (T.R.H.)

12810

STABILIZATION OF HIGH FREQUENCY VOLTAGE ON THE CYCLOTRON DEES. A. V. Antonov, Yu. V. Korshunov, E. A. Meleshko, and V. S. Panasyuk. Pribory i Tekh. Ekspt. No. 1, 41-6(1958) Jan. (In Russian)

The operation and scheme for an amplitude stabilizer of the high-frequency voltage on one of the cyclotron dees are described. The stabilizer can be adapted to continuous or pulse conditions. Various parts of the regulation cycle are investigated. (tr-auth)

12811

ON THE INTERNAL INJECTION OF ELECTRONS IN A BETATRON. V. N. Logunov and S. S. Semenov (Lebedev Inst. of Physics, Academy of Sciences, USSR). Pribory i Tekh. Ekspt. No. 1, 49-50(1958) Jan. (In Russian)

Measurements were made for two injectors distributed on the external and internal side of an equilibrium orbit. The work was done with a 30-Mev synchrotron. Measurements of the γ-radiation intensity during the synchrotron operation with the external and internal injectors show that with equal injection parameters the absolute intensity of γ radiation is identical for both cases. The dependence of the bremsstrahlung yield during capture in various parts of the injection pulse is also identical for both cases. (R.V.J.)

12812

APPLICATIONS OF NUCLEAR RESONANCE IN MAGNETIC MEASUREMENTS ON SYNCHROPHASOTRON. S. S. Kurochkin and M. P. Zel'dovich. Pribory i Tekh. Ekspt. No. 1, 50-3(1958) Jan. (In Russian)

The applications of nuclear magnetic resonance in the 180-Mev synchrophasotron for investigation of the stability of field transducers and their absolute calibrations, for determination of the magnetic field bond stability at various points, and for measuring the accelerating voltage frequency are described. The scheme of the apparatus used in the studies is included. (tr-auth)

12813

MAGNETIC MEASUREMENTS IN A SYNCHROPHASOTRON WITH PERMALLOY TRANSDUCERS. S. S. Kurochkin. Pribory i Tekh. Ekspt. No. 1, 53-5(1958) Jan. (In Russian)

A method is examined for determination of the distribution and shape of the magnetic median surface in a synchrophasotron magnet along the radial field component. Applications of transducers for measuring the bond stability of the scattered field and the field in the gap of the electromagnet are described. The technology of transducers is included. (tr-auth)

12814

MINNESOTA 10-, 40-, AND 68-Mev PROTON LINEAR ACCELERATOR. E. A. Day, R. P. Featherstone, L. H. Johnston, E. E. Lampi, E. B. Tucker, and J. H. Williams (Univ. of Minnesota, Minneapolis). Rev. Sci. Instr. 29, 457-76(1958) June.

A description is given of those features of the University of Minnesota proton linear accelerator which extend the design of the Berkeley linear accelerator. These features are: three separate resonant cavities in series which produce, respectively, beams of 10-, 40-, and 68-Mev protons, as well as appreciable currents when desired at energies between 25 and 68 Mev; a 500-kv a-c injector; a 200-Mc amplifier system with three isolated output stages producing 0.6, 2.2, and 3.2 Mw of pulsed power; automatic frequency control systems; phase detectors; phase shifters; magnets; shielding and accessory equipment. The characteristics of the output proton beams are described, and a brief statement is made of the experiments being performed. (auth)

12815

PRODUCTION OF MILLIMICROSECOND PULSES BY RADIO-FREQUENCY SWEEPING OF THE ION BEAM IN THE TERMINAL OF AN ELECTROSTATIC ACCELERATOR. C. M. Turner and S. D. Bloom (Brookhaven National Lab., Upton, N. Y.). Rev. Sci. Instr. 29, 480-7 (1958) June.

Apparatus has been installed in the high-voltage terminal of the Brookhaven National Laboratory research electrostatic accelerator for production of ion current pulses in the millimicrosecond range by radio-frequency sweeping of the beam across a limiting aperture between the ion source and acceleration tube. Proton and deuteron pulses with a full width at half-maximum of about 4.5 millimicroseconds are presently available, with a pulse repetition time of 134 millimicroseconds and an average current of 1–2 microamperes. A simple electrostatic refractor rejects pulses to give one pulse per r-f cycle. The following advantages of this method are to be noted: it minimizes the production of background radiations by ions which are not used on the target and the reduced duty factor makes it potentially possible to correspondingly increase the instantaneous intensity during pulses. The usefulness of the system has been demonstrated by the measurement of the delayed deexcitation by γ emission of the first excited state in B^{10}. (auth)

12816

LIQUID-TARGET HOLDER FOR USE WITH SEPARATED ISOTOPES. B. G. Goldring and R. P. Scharenberg (Massachusetts Inst. of Tech., Cambridge). Rev. Sci. Instr. 29, 532(1958) June.

A liquid-target holder for use with high-voltage accelerators has been developed and consists of a 0.06 cm^3 container with a (≤1 mg/cm^3) quartz window and a filling and bubble exhaust tube. The normal operating life of the target is 15 hr and is limited by fatigue of the quartz window. (W.D.M.)

12817

THEORY OF THE RADIATION ELECTRON. A. A. Sokolov. Trudy 3-go Vsesoyuz. Mat. S'ezd. 95-6(1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 5674.)

After developing the theory of the emission from a radiating electron, the author notes that the attenuation time of the betatron oscillations is $t = [3r^2/2r_0c(1-q)]mc^2/E$, where q is the index representing the drop in the magnetic field near the equilibrium orbit with radius r. This time is large compared with the sensible values of the duration of the acceleration cycle, and consequently the radiation attenuation can be neglected up to very large energies.

Radiation Absorption and Scattering

12818 AFOSR-TN-58-536

Stanford Univ., Calif.

ELECTRON-DEUTERON SCATTERING BY THE IMPULSE APPROXIMATION. Technical Report No. 35.

A. Goldberg. June 1958. 20p. Contract AF18(600)-545. (AD-158352).

The cross section for inelastic scattering of high-energy electrons by deuterons is calculated using the impulse approximation. The results agree with those of Jankus. The cross sections are given for several neutron charge and moment distributions. The peak cross sections are simply related to the free-nucleon cross sections with this approximation. (auth)

12819 ANL-5823

Argonne National Lab., Lemont, Ill.

TABLES OF ANGULAR COEFFICIENTS USED IN THE THEORY OF THE SCATTERING OF NUCLEONS BY DEUTERONS. Kenneth Smith. June 1958. 114p. Contract W-31-109-eng-38. $2.50(OTS).

The angular coefficients given are summations over the parameters of Racah coefficients and Clebsch-Gordon coefficients which arise in nucleon-deuteron scattering when the assumed phenomenological force between two nucleons has a tensor component. The coefficients were calculated on an electronic digital computer (IBM-650) for those values of the total angular momentum, J, in the range $\frac{1}{2} \leq J \leq \frac{9}{2}$. (auth)

12820 CWR-400-4

Curtiss-Wright Corp. Research Div., Quehanna, Penna.

ENERGY DISTRIBUTIONS OF NEUTRONS SCATTERED FROM LEAD. C. E. Mandeville and Devereux L. Kavanagh. Mar. 1958. 73p. $12.30(ph OTS); $4.50 (mf OTS).

The energy limits of neutrons inelastically scattered by Pb^{206}, Pb^{207}, and Pb^{208} were calculated. The energy distributions of neutrons (5.5 to 10 Mev) inelastically scattered by naturally occurring lead were calculated. The energy limits of elastically scattered neutrons by lead were obtained. (W.D.M.)

12821 CWR-400-5

Curtiss-Wright Corp. Research Div., Quehanna, Penna.

DIFFERENTIAL CROSS SECTIONS FOR ELASTIC SCATTERING OF NEUTRONS FROM ALUMINUM IN THE ENERGY RANGE 0.5–10.0 MEV. S. C. Snowdon. Oct. 1957. 41p. $7.80(ph OTS); $3.30(mf OTS).

The method of interpolating the differential elastic scattering cross sections between those energies for which experimental cross sections are available has been applied to neutrons elastically scattered from aluminum. Experimental data at 0.6, 2.5, 4.1, 7.0, and 14.1 Mev were analyzed in Legendre polynomial series. The variation of each Legendre coefficient with energy was assumed to be a smooth function of energy. The experimentally obtained coefficients served to define a series of curves from which the Legendre coefficients may be found for any energy in the range 0.6 to 14 Mev. (W.D.M.)

12822 CWR-496

Curtiss-Wright Corp. Research Div., Quehanna, Penna.

INTERPOLATION OF EXPERIMENTAL CROSS SECTIONS FOR ELASTIC SCATTERING OF NEUTRONS FROM IRON. S. C. Snowdon. Aug. 1, 1957. 49p. $9.30(ph OTS); $3.60(mf OTS).

A method of interpolation between experimental points such that differential cross sections for the elastic scattering of neutrons may be obtained at intervals of 0.5 Mev throughout the energy range 1.0 to 10.0 Mev has been developed. The theory involved in this interpolation simply assumes that the energy variation of each coefficient in the Legendre polynomial expansion of the differential cross section is a smooth function of the energy. A graph of each polynomial coefficient was obtained as a function of energy. The coefficients for the desired energies were chosen, and a Legendre polynomial synthesis then gave the desired angular distributions. (W.D.M.)

12823 UCRL-5263

California. Univ., Livermore. Radiation Lab.

ANALYSIS OF P-P SCATTERING EXPERIMENTS BELOW 40 MEV. Malcolm H. MacGregor. June 16, 1958. 13p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

A phase-shift analysis was made of p-p scattering measurements at 1.855, 4.203, 9.68, 9.73, 18.2, 19.8, 31.8, and 39.4 Mev. By means of a parametrization method developed by Clementel and Villi, which gives the $^3P_0$, $^3P_1$, and $^3P_2$ phase shifts for any combination of $^1S_0$ and $^1D_2$ phase shifts, a region in the $^1S_0$–$^1D_2$ plane was mapped out inside of which good fits to the angular distribution can be obtained. It was found that angular momentum components with $l > 2$ are needed at 40 Mev to obtain reasonable fits to angular distribution and polarization measurements. At 20 Mev, $l \leq 2$ is sufficient. For each $^1S_0$–$^1D_2$ pair, there are four sets of P phase shifts that give equally good fits to the angular distribution. A simple potential model consisting of the asymptotic second-order meson potential extended in to a repulsive core was used to choose between the four sets. In order to specify a unique set of phase shifts, polarization measurements at low energies will be necessary. (auth)

12824 AEC-tr-3257

ELECTROMAGNETIC RADIATION IN NEUTRON-PROTON COLLISIONS. G. M. Avak'yants. Translated from Zhur. Eksptl'. i Teoret. Fiz. 20, 944-6(1950). 4p.

The cross sections for electromagnetic radiation emission when fast neutrons collide with protons, considering the exchange currents that arise during impact, are computed. (auth)

12825 AEC-tr-3281

POSSIBLE EXPERIMENTS ON THE INVESTIGATION OF THE PROCESSES OF INELASTIC SCATTERING OF NUCLEONS. PART I. L. M. Soroko. Translated from p.1-17 [of] Vozmozhnyye Opyty po Issledovaniyu Protsessov Neuprugogo Rasseyaniya Nuklonov, U.S.S.R., May 1957. 15p. (Translation partially illegible).

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 1742.

12826

SURVEY OF STOPPING POWER. Werner Brandt (E. I. Du Pont de Neumors & Co., Wilmington, Del.). Health Phys. 1, 11-20(1958) June.

This survey discusses the status of stopping power problems pertinent to dosimetry. It is shown that stopping powers of light elements can be predicted with high accuracy over wide energy ranges. A systematic discrepancy of ca 2 per cent still exists between the stopping powers of heavy elements derived from measurements with high-energy particles, and those derived from measurements with low-energy particles. This discrepancy may arise from an underestimate of the stopping-power deficiency of inner atomic shells at low energies as introduced by the presently available theoretical inner-shell corrections. Only the Z-dependence of mean excitation potentials derived from high-energy experiments is in concord with the statistical Thomas–Fermi–Dirac model of the atom. The non-additivity of stopping powers can be incorporated nearly quantita-

tively in stopping power calculations by applying valence-state corrections to the mean excitation potentials of atoms. (auth)

12827

W FOR HEAVY PARTICLES. Lewis W. Cochran (Univ. of Kentucky, Lexington). Health Phys. 1, 34-8(1958) June.

The values of W, the average energy expended per ion pair produced in a gas, are listed for many pure gases. The change of W with small amounts of contaminant gases, the determination of an effective W for gas mixtures, and the variation of W with velocity for very low velocity particles are considered. Values of W for low-energy, high-mass recoil atoms are compared with the values obtained with alpha particles in the same gases. (auth)

12828

QUASI-ELASTIC SCATTERING AND NUCLEAR STRUCTURE. Th. A. J. Maris (Univ. of Uppsala and Univ. of Copenhagen) and Peter Hillman and H. Tyrén (Univ. of Uppsala). Nuclear Phys. 7, 1-9(1958) June (1).

Energy and angular correlation measurements on the two protons emerging from high-energy (p,2p) processess may give direct information on the structure of the ground state of the bombarded nucleus and of certain excited states of the residual one. Expectations are derived on the basis of the assumptions of the approximative validity of the shell model and the Serber-Chew hypothesis of the reaction mechanism. The influence of multiple collisions in the nucleus is considered. (auth)

12829

HIGH ENERGY (p,2p) REACTIONS AND PROTON BINDING ENERGIES. H. Tyrén, Peter Hillman, and Th. A. J. Maris (Univ. of Uppsala). Nuclear Phys. 7, 10-23(1958) June (1).

The energy carried away by each of the two coincident protons from (p,2p) reactions in elements bombarded by 185-Mev protons has been measured by range analysis. To the extent that the collision is quasi-elastic, the difference between the sum of these energies and the incident energy, corrected for the recoil energy of the residual nucleus, gives the binding energy of the struck proton in the nucleus. Sharp groups which can be associated with the nuclear shell structure have been observed in the light elements. The results determine directly the spin-orbit splitting in the 1p shell and the binding energy of the 1s shell for the lightest nuclei. Only the spectrum of Be^9 might give some indication of an α-particle structure. (auth)

12830

INELASTIC SCATTERING OF 185 Mev PROTONS ON ELEMENTS BETWEEN Ca AND Zn. H. Tyrén and Th. A. J. Maris (Univ. of Uppsala). Nuclear Phys. 7, 24-6(1958) June (1).

The energy spectra for inelastic scattering of 185-Mev protons on V, Cr, Mn, Fe, Co, Ni, Cu, and Zn are given at angles between 10 and 18°. (W.D.M.)

12831

GAMMA-RAY ATTENUATION WITH BUILDUP IN WATER. David G. Chappell (General Electric Co., Schenectady, N. Y.). Nucleonics 16, No. 7, 80(1958) July.

A nomograph which gives the attenuation factor for a water shielding slab used with a point source of gamma radiation is presented. (J.S.R.)

12832

THE CAPTURE OF SLOW NEUTRONS BY PROTONS. A. R. Baker and D. H. Wilkinson (Cavendish Lab., Cambridge, Eng.). Phil. Mag. (8) 3, 647-51(1958) June.

The result of a new experimental determination of the capture cross section of protons for slow neutrons is briefly reported. It is $\sigma_H = 0.327 \pm 0.004$ barns and is obtained by a comparison with the absorption of boron for slow neutrons. A survey is presented of various direct and indirect methods for determining the neutron-proton capture cross section and the final value resulting from their inter-comparison is $\sigma_H = 0.3315 \pm 0.0017$ barns. (auth)

12833

EFFECT OF DEGREE OF ORIENTATION AND CRYSTAL SIZE ON THE SCATTERING OF 20-kev ELECTRONS BY ALUMINUM. L. Marton, J. Arol Simpson, J. A. Suddeth, M. D. Wagner (National Bureau of Standards, Washington), and Hiroshi Watanabe (Hitachi Central Research Lab., Kokubunji, Tokyo). Phys. Rev. 110, 1057-60(1958) June 1.

The energy distribution of 20-kev electrons scattered by aluminum has been measured as a function of degree of crystalline orientation and foil thickness. For equal physical thickness the foils with higher degree of orientation are electron-optically thinner. Over a range of thickness from 35 to 500 A, the values of the first two characteristic losses are 6.3 ± 0.1 ev and 15.0 ± 0.1 ev. They exhibit no systematic change with thickness greater than the experimental uncertainty. The intensity ratio between the two losses is essentially constant within this range. It is concluded that the low-lying (6.3 ev) loss is not due to the depolarization effect of grain boundaries. (auth)

12834

ROTATIONAL-OPTICAL MODEL FOR SCATTERING OF NEUTRONS. D. M. Chase and L. Wilets (Los Alamos Scientific Lab., N. Mex.) and A. R. Edmonds (Inst. for Theoretical Physics, Copenhagen). Phys. Rev. 110, 1080-92(1958) June 1.

The scattering of neutrons by a deformed, rotating, even-even nucleus has been investigated with a diffuse-surfaced complex potential employed. Two essential approximations, for which justification is presented, are made: (1) Nuclear excitations corresponding to $I \geq 6$ are ignored. (2) In the expansion of the nuclear potential, $V(r,\theta') = \Sigma v_\lambda(r) P_\lambda(\cos\theta')$, terms with $\lambda \geq 4$ are omitted. Comparison with earlier calculations by other authors, employing a distorted-wave Born approximation and δ-function interaction, indicates that the earlier work seriously overestimated direct excitation. At low energies ($\lesssim$1 Mev), the excitation cross section given by the direct process is small compared with excitation through the compound nucleus, but the direct process may contribute significantly to the angular distribution due to its large anistropy. The relevance of this work to the measurements of the differential cross section for excitation of the I = 2 first excited level of U^{238} is discussed in some detail. The general features of the experimental variation of the strength function $\overline{\Gamma}^0_n/D$ and potential-scattering length R' with mass number at low energy have been reproduced by a calculation with suitably varying deformation. (auth)

12835

INELASTIC SCATTERING OF PHOTONS IN Y^{89}. E. Silva and J. Goldemberg (Univ. of São Paulo, Brazil). Phys. Rev. 110, 1102-3(1958) June 1.

The cross section for the inelastic scattering of photons in Y^{89} has been measured from 4 to 22 Mev. Two peaks were observed, and their significance is discussed. (auth)

12836

ANGULAR DISTRIBUTION OF FRAGMENTS FROM FISSION OF U^{238} AND Th^{232} BY 45-, 80-, AND 155-Mev

PROTONS. J. W. Meadows (Harvard Univ., Cambridge, Mass.). Phys. Rev. 110, 1109-13(1958) June 1.

Measurements have been made of the angular distributions of $Sr^{91,92}$, $Ag^{112,113}$, Ba^{139} and the total fission products from proton-induced fission of U^{238} at 45, 80, and 155 Mev and Th^{232} at 45 and 155 Mev. The anisotropy decreases with increasing energy and is negative for asymmetric fission at 155 Mev. (auth)

12837

PION SCATTERING AND DISPERSION RELATIONS. J. Hamilton (Cornell Univ., Ithaca, N. Y.). Phys. Rev. 110, 1134-9(1958) June 1.

Inaccuracies in the experimental data which might give rise to the discrepancy in the dispersion relations for the forward scattering of negative pions (up to a few hundred Mev) are examined. The discrepancy cannot be removed without contradicting one of the several apparently accurate experimental results. A relation to check charge independence is suggested. (auth)

12838

π^--p SCATTERING AND THE DISPERSION RELATION. Hong-Yee Chiu (Cornell Univ., Ithaca, N. Y.). Phys. Rev. 110, 1140-2(1958) June 1.

Theoretical values for $D_-(\omega)$ in the theory of pion dispersion relations have been recalculated with a suitable modification of the experimental values for σ_{tot}^-. This modification is supported by the results obtained from a recent phase-shift analysis. Agreement with the experimental values for $D_-(\omega)$ is achieved for pion kinetic energies $\lesssim$220 Mev. It may be concluded that the theoretical values for $D_-(\omega)$ have a strong dependence on the detailed shape of the peak of σ_{tot}^- near the resonance. (auth)

12839

POLARIZATION OF NUCLEONS ELASTICALLY SCATTERED BY NUCLEI. Keiichi Nishimura (Rutgers Univ., New Brunswick, N. J.). Phys. Rev. 110, 1166-8 (1958) June 1.

The polarization of 424-Mev nucleons elastically scattered by nuclei is calculated by a method which is similar to the Born approximation, but in which the phase shifts of the incident plane wave due to the scattering potential is taken into consideration. A qualitative agreement with the experimental result is obtained if one uses the well parameters determined by Riesenfeld and Watson. Poor agreement at the diffraction minimum may be attributed to the existence of inelastic scattering in the experimental data. (auth)

12840

APPLICATION OF THE SPIN-FLIP DISPERSION RELATIONS TO THE MINAMI AMBIGUITY FOR THE PION-NUCLEON SCATTERING. S. J. Lindenbaum and R. M. Sternheimer (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 110, 1174-8(1958) June 1.

The dispersion relations for the spin-flip amplitude of the pion-nucleon scattering in the forward direction have been applied to the Minami phase shifts obtained from the Fermi set in a calculation similar to that of Davidon and Goldberger for the Fermi and Yang phase shifts. The Minami phase shifts were found to be in disagreement with the requirements of the dispersion relations. The same calculation was also carried out for a new set of phase shifts, which is obtained by applying the Minami transformation to the Yang phase shifts. These phase shifts are also incompatible with the dispersion relations. (auth)

12841

TIME-REVERSAL INVARIANCE IN NUCLEAR SCATTERING. Peter Hillman, Arne Johansson, and Gunnar Tibell (Univ. of Uppsala). Phys. Rev. 110, 1218-19(1958) June 1.

Experimental tests of time-reversal invariance and parity conservation in high-energy nuclear scattering are reported. The work was carried out because of the discovery of the failure of parity conservation in weak interactions. Comparisons of e and P for proton scattering by hydrogen, lithium, beryllium, and aluminum are made. (A.C.)

12842

EXPERIMENTAL OBSERVATION OF DOUBLE COULOMB EXCITATION. J. O. Newton and F. S. Stephens (Univ. of California, Berkeley). Phys. Rev. Letters 1, 63-5(1958) July 15.

Double E2 Coulomb excitation was observed by bombarding thick targets of natural tungsten with oxygen ions from a heavy-ion linear accelerator. The gamma rays arising from the decay of the excited states were observed with $1 \times 1\frac{1}{2}$ in. NaI(Tl) crystals together with a 50-channel and a single-channel pulse-height spectrum showed two broad peaks, having mean energies of 114 and 250 kev. (W.D.M.)

12843

SEMIPHENOMENOLOGICAL THEORY OF Σ^+ HYPERON-PROTON SCATTERING UP TO 150 Mev. R. A. Bryan, J. J. de Swart, and R. E. Marshak (Univ. of Rochester, N. Y.). Phys. Rev. Letters 1, 70-2 (1958) July 15.

The differential cross section and the polarization for Σ^+–p scattering was computed on the basis of the semiphenomenological SM potential at three energies for Σ^+: 40, 100, and 150 Mev. It was necessary to cut off the deep triplet central potential in the even parity states in these computations. (W.D.M.)

12844

OPTICAL MODEL POTENTIAL AT THE NUCLEAR SURFACE FOR THE ELASTIC SCATTERING OF ALPHA PARTICLES. George Igo (Los Alamos Scientific Lab., N. Mex. and Stanford Univ., Calif.). Phys. Rev. Letters 1, 72-4(1958) July 15.

The elastic scattering of 18-Mev alpha particles from argon, 40-Mev alpha particles from copper, and 48-Mev alpha particles from lead was analyzed in terms of the optical model. The family of nuclear potentials which can be generated by changing all four parameters (V, W, γ_0, d) was employed. (W.D.M.)

12845

THE INELASTIC SCATTERING OF 9.8 Mev PROTONS BY MEDIUM WEIGHT NUCLEI. G. W. Greenlees, J. Lowe, A. B. Robbins, and P. M. Rolph (Univ. of Birmingham, Eng.). Proc. Phys. Soc. (London) 71, 904-9 (1958) June.

Recent experiments on the inelastic scattering of protons by nuclei of medium Z have shown some unexpected effects, in particular, a pronounced increase in cross section at excitations of 2 to 3 Mev in all elements with Z between 40 and 52. A search for this 'anomalous scattering' has been made in Sn, In, Cd, Ag, Pd, Mo, Nb, Zn, Cu, and Ni, using 9.8 Mev protons. The prominent effect at excitations of 2 to 3 Mev was not found at 9.8 Mev. In Cu, Zn, and Ni an intense group corresponding to excitations of 1 to 1.4 Mev was observed. (auth)

12846

FAST NEUTRON DATA ON THE ISOTOPES OF THORIUM, URANIUM AND PLUTONIUM. W. D. Allen (Atomic Energy Research Establishment, Harwell, Berks, Eng.) and R. L. Henkel (Los Alamos Scientific

Lab., N. Mex.). Progr. Nuclear Energy Ser. 1, Phys. Math. 2, 50p. New York, Pergamon Press.

A survey is presented of available information on the interaction of neutrons in the range 10 kev to 10 Mev with the isotopes of thorium, uranium and plutonium. Subjects discussed include total cross sections, elastic and inelastic scattering, (n,2n) reactions, capture and fission, including the variation with energy of $\bar{\nu}$, the average number of neutrons emitted per fission. (auth)

12847

THE ENERGY DEPENDENCE OF A SCATTERING CROSS SECTION NEAR THE THRESHOLD OF A REACTION. A. I. Baz'. Soviet Phys. JETP 6, 709-13 (1958) Apr.

The energy dependence of the cross section for an elastic scattering process X(aa)X is examined at energies near the threshold for a reaction X(ab)Y (b being a neutron). It is shown that the scattering cross section has a singularity at the threshold. From the singularity, one can obtain the spin and parity of the nucleus Y formed in the reaction, and also simplify the phase analysis of the elastic scattering. (auth)

Radiation Effects

12848 AD-140340

Autonetics Div., North American Aviation, Inc., Downey, Calif.

RESISTANCE OF SILICON TRANSISTORS TO NEUTRON BOMBARDMENT. Ronald C. Gillis and John W. Tarzwell. Mar. 15, 1957. 38p. Contract AF33(600)-28469. (EM-1202).

An investigation has been started to determine the radiation resistance of various types of silicon transistors and diodes. That portion of the investigation concerned with the effect of neutron bombardment on transistors is discussed. Test data and resultant conclusions are presented. (auth)

12849 CRDC-718

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

IRRADIATION OF COMPACTED AND SINTERED URANIUM OXIDE IN THE X-2 LOOP TESTS X-2-f AND X-2-i. R. F. S. Robertson and G. M. Allison. May 1958. 101p.

In the experiments described in this report three types of compacted and sintered uranium oxide sheathed in Zircaloy-2 were irradiated in the X-2 loop in NRX in 525°F water. Two of these types were essentially stoichiometric $UO_{2.0}$ and of about the same density, 9.5 g/cc. They differed in the manufacturing process used and in the sintering time in hydrogen. The third type tested was $UO_{2.19}$ and its preparation included sintering in argon to give a density of about 10.4 g/cc. All the oxide irradiated contained 4.77 wt. % U^{235} in U and was about the same diameter, 0.25". A defect test was run on each type of fuel in which a 0.006" diameter hole was drilled through the Zircaloy-2 sheath. Post irradiation examination of the fuel elements yielded the following results: All the oxide fuel withstood the irradiation (up to 5000 Mwd/ton UO_2) without any significant change in external dimensions. The Zircaloy-2 sheaths did not suffer from corrosion or irradiation damage. The undefected stoichiometric UO_2 specimens showed radial cracking but no transverse cracking. Neither melting nor grain growth was observed. The defected $UO_{2.0}$ specimens showed transverse as well as slight radial cracking. No melting occurred but there appeared to be a suggestion of grain growth. The undefected $UO_{2.19}$ specimens both contained a central void with columnar crystals extending outwards from the hole. The defected $UO_{2.19}$ specimen did not contain a central void but grain growth was evident at the center of the oxide. A large amount of yellow color was apparent. During the defect tests ratios of fission product activities found indicated that the main mechanism for the entrance of the activities into the loop water was diffusion out of the UO_2 rather than direct emission from fission recoils. In comparing the release of fission product activity from each type of uranium oxide it was found that the $UO_{2.19}$ defected specimen emitted considerably more activity than the two stoichiometric $UO_{2.0}$ defected specimens. Of these latter two the one which had had the longer sintering time released the lesser amount of fission products. It was also found that after the reactor shut down the amount of fission product gases released through the defect was negligible. During the test three different water conditions were employed with subsequent examination of fuel specimens after each period. The following effects of water conditions were found: When the water was at pH 7 and conductivity <1 μmho cm^{-1} the crud level in the water was in the range 10-50 ppb and a crud deposit (0.004" thick) was found on the fuel elements. Subsequent operation of the loop with the water neutral and 2×10^{-4} M in K_2SO_4 reduced the crud level in the water to 1-2 ppb. Examination of some of the fuel specimens indicated there was no deposited crud. The defect tests were run with the water at pH 9.5-10.5. No crud measurements were made during these parts of the test but results from other loop experiments under the same water conditions have indicated that the crud level in the water would be in the range 1-10 ppb. Again examination of the fuel elements indicated no crud deposit. (auth)

12850 SCTM-187-58(51)

Sandia Corp., Albuquerque, N. Mex.

THE EFFECTS OF A PULSE OF NEUTRONS AND GAMMAS ON N-TYPE GERMANIUM. H. J. Stein, R. R. Berner, and F. M. McIver. June 19, 1958. 11p. Contract AT(29-1)-789. $3.30(ph OTS); $2.40(mf OTS).

The effects of a pulse of neutrons on the hole lifetime in N-type germanium were investigated and compared with the effects of reactor irradiation on similar material. Information on the minority carrier decay immediately after the neutron pulse was also obtained along with conductivity changes in a 30-min. period after the pulse. No dose rate effects could be established from a peak exposure rate of 10^{19} n_fvt/sec by making before and after (5 days) irradiation measurements of the minority carrier lifetime. A minority carrier lifetime determined from the photoconductivity-decay immediately after the burst is larger by approximately a factor of 8 than a lifetime measured 5 days later. The conductivity decreased during the first 5 minutes after the burst. However, 10 minutes after the burst, the conductivity began to increase again. The temperature change of the sample was 0.5°C. The conductivity changes therefore suggest that an annealing process must be occurring immediately after the burst. (auth)

12851

A SIMPLE TEMPERATURE REGULATING MEANS FOR IRRADIATION EXPERIMENTS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 205, Session 15. C. V. Moore (General Electric Co.). New York, American Institute of Chemical Engineers, 1958. 17p.

A temperature regulating means for irradiation capsules consisting of two closely fitting concentric cylinders separated by an evacuated space is described. Equations describing the performance of the device are derived and an example of their use is given. The predictions of these equations are compared with the results of experimental data. Other possible applications for the device are mentioned. (auth)

Radioactivity

12852

DETERMINATION OF THE GAMOW-TELLER BETA-DECAY INTERACTION FROM THE DECAY OF HELIUM-6. W. B. Herrmansfeldt, R. L. Burman, P. Stähelin, and J. S. Allen (Univ. of Illinois, Urbana). Phys. Rev. Letters 1, 61-3(1958) July 15.

The electron-neutrino angular correlation coefficient has been measured for the negatron decay of $He^6 \cdot He^6$ decays with a half life of 0.85 sec by beta emission to Li^6 with a maximum beta energy of 3.5 Mev and a spin change $\Delta I = 1$ with no change in nuclear parity. Thus, He^6 obeys only the rules for allowed Gamow-Teller decay, and the angular correlation coefficient λ should be either $+\frac{1}{3}$ or $-\frac{1}{3}$ corresponding to the tensor or axial vector interaction. The experimental value of $\lambda = 0.39 \pm 0.002$ clearly indicates that the axial vector interaction is dominant. (W.D.M.)

12853

GAMMA TRANSITIONS IN SELF-CONJUGATE NUCLEI. E. K. Warburton (Princeton Univ., N. J. and Brookhaven National Lab., Upton, N. Y.). Phys. Rev. Letters 1, 68 (1958) July 15.

It has been shown that the rule "M1 transition strengths between levels with the same T in self-conjugate nuclei are expected to be on the average weaker by a factor 100 than the normal M1 transition strengths" may be expected to hold. This rule is shown to follow directly from the general matrix element for M1 gamma transitions with the isotopic spin formalism included. It is pointed out that the inhibition shown for M1 transitions may be expected to hold for magnetic transitions in general. (W.D.M.)

12854

HIGHER-ORDER EFFECTS IN THE ALLOWED BETA DECAY OF F^{20}. F. Boehm, Volker Soergel, and Berthold Stech (California Inst. of Tech., Pasadena). Phys. Rev. Letters 1, 77-9(1958) July 15.

An experimental study of the coefficient of $\cos^2\theta$(θ angle between electron and gamma quantum) was done for the beta decay of F^{20}. The F^{20} was produced by bombarding CaF with 1.7-Mev deuterons. Result of the measurement for the correction term accepting all electrons above 4.5 Mev is $a = (+0.94 \pm 0.28)\%$. (W.D.M.)

12855

L_I, L_{II}, L_{III} AND M INTERNAL CONVERSION LINES OF THE 411.8-kev TRANSITION IN Hg^{198}. D. Reitmann, H. Schneider, and I. J. van Heerden (Council for Scientific and Industrial Research, Pretoria). Phys. Rev. 110, 1093-4(1958) June 1.

The $L_I : L_{II} : L_{III}$:M internal conversion ratios for the 411.8-kev γ-ray transition in Hg^{198} were measured and compared with the theoretical E2 values. The results indicate that the finite nuclear size effect, if present, is small. (auth)

12856

DECAY OF SELENIUM-72. James B. Cumming Brookhaven National Lab., Upton, N. Y.) and Noah R. Johnson (Florida State Univ., Tallahassee and Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 110, 1104-8(1958) June 1.

Se^{72} has been observed to decay by electron capture with a half-life of 8.40 ± 0.08 days, predominantly to an excited state in As^{72} at 46.0 ± 0.3 kev. The half life of this state is less than 1.5×10^{-8} sec. Less than 7% of Se^{72} decays are to the ground state. The K-conversion coefficient of the 46-kev gamma was measured to be 0.63 ± 0.06 and the K/L conversion ratio to be 9.7 ± 0.5. The upper limit, 0.1%, obtained for the abundance of positrons places a maximum value on the decay energy of 1.2 Mev, which corresponds to a maximum log ft of 5.7. On these grounds the excited state is assigned a 1+ spin and the gamma transition is E1. In the course of these measurements, the ratio of intensities of x rays to 46-kev gamma rays in the decay of RaD (Pb^{210}) was redetermined to be 5.38 ± 0.50. (auth)

12857

SHORT LIVED FISSION PRODUCT GAMMA RADIATION. W. Zobel and T. A. Love (Oak Ridge National Lab., Tenn.). pp. 25-33 in "The Shorter-Term Biological Hazards of a Fallout Field." Gordon M. Dunning and John A. Hilcken, eds. Washington, Atomic Energy Commission—Department of Defense, 1958. 236p. Available from U. S. Government Printing Office for $1.75.

Samples of U^{235} varying from 2 to 32 mg in size were sent pneumatically into a graphite reactor and removed after times ranging from 0.7 to about 64 seconds. The energy spectrum and time behavior of the gross fission-product gamma-ray mixtures was measured at short times, starting about 1 second after fission. Data are presented graphically. (C.H.)

Rare Earths and Rare-earth Compounds

Refer also to abstract 12835.

12858 USBM-C-172

Bureau of Mines. Northwest Electrodevelopment Lab., Albany, Oreg.

RARE EARTH ALLOYS FOR CONTROL OF ATOMIC REACTORS. Third Quarterly Progress Report for Fiscal Year 1957. Decl. Mar. 4, 1958. 14p. $3.30 (ph OTS); $2.40(mf OTS).

The work was concerned primarily with stainless steel and titanium alloys containing high percentages of gadolinium and europium. Data are given on corrosion, fabrication, and melting points of these alloys. Photomicrographs showing alloy structure are included. (M.H.R.)

12859

MAGNETIC PROPERTIES OF CERTAIN RARE EARTH DOUBLE NITRATES. B. R. Judd and Eugene Wong (Univ. of Chicago). J. Chem. Phys. 28, 1097-1100(1958) June.

Paramagnetic resonance experiments have been performed with crystals of diluted erbium magnesium nitrate and diluted holmium magnesium nitrate. Resonance was observed in the first case but not in the second. These experimental results and in addition the Zeeman effects in neodymium magnesium nitrate are interpreted in terms of a crystalline electric field of predominantly icosahedral symmetry. (auth)

12860

ISOTOPIC SHIFT IN THE SPECTRUM OF DYSPROSIUM. Yu. P. Dontsov. Optika i Spektroskopiya 1, No. 5, 612-

16(1956). (Translated from Referat. Zhur. Khim. No. 6, 1957, Abstract No. 18119.)

The isotopic shift in the spectrum of dysprosium was investigated in the region from 3900 to 6850 A. The spectrum was excited in a hollow cathode tube cooled with liquid nitrogen. The isotopic shift was measured in Dy^{162} and Dy^{164} for 52 lines of the neutral atom and 3 lines of the ionized atom. The position of a component of Dy^{160} was measured for 4 lines. The majority of lines show a negative shift, ranging from 0.024 to 0.074 cm^{-1}. A table showing the shifts is given. On the basis of the value and direction of the isotopic shift, certain suppositions are made concerning possible electron configurations of levels participating in transitions.

12861

DISTRIBUTION OF ELECTRONS IN ATOMS OF THE RARE EARTH METALS. T. I. Kakushadze, G. S. Gordadze, and M. G. Kokonova. Trudy Tbilis. Gosudarst. Pedagog. Inst. 10, 573-85(1955). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8929.)

The electron configurations of the neutral atoms of the lanthanides are taken in the specialized literature to be $4f^{0-14}5d^{1}6s^{2}$ and $4f^{0-14}6s^{2}$. In the authors' opinion, both these configurations exist simultaneously. The first gives the magnetic properties and the normal valence of the lanthanides, and the second gives the spectroscopic characteristic of the lanthanides. By virtue of this it is necessary to retain in the literature both configurations.

Shielding

12862 ARDE(M)-24/57

Gt. Brit. Armament Research and Development Establishment, Fort Halstead, Kent, England.

LEAD CONTAINERS FOR RADIOACTIVE ISOTOPES: THEIR WALL THICKNESS AND ITS CALCULATION. R. S. Morgan. May 1957. 16p. (AD-136006).

The design of source containers with adequate safety without sacrificing portability is discussed. (A.C.)

12863 BMI-APDA-622

Battelle Memorial Inst., Columbus, Ohio.

A STUDY OF THE PRIMARY SHIELD FOR THE PRDC REACTOR. Harold M. Epstein, David A. Dingee, and Joel W. Chastain. Apr. 15, 1957. 34p. For Atomic Power Development Associates, Inc. $6.30(ph OTS); $3.00(mf OTS).

Temperature distributions, irradiation effects, stacking arrangements, voidage, and economics for the borated-graphite shield of the PRDC reactor were investigated. Of the shield systems considered, four are reported here. System 1 contains 30 in. of 1% borated graphite, with either ordinary graphite or a cement as a filler for the remainder of the volume. The maximum temperature at the flex plates in this system was calculated to be 500°F. Systems 2 and 3 consist of 2 in. of 5% borated graphite near the core vessel and ½ in. of Boral at the primary-shield tank. A filler material of carbon blocks is used in System 2 and graphite in System 3. The calculated maximum temperatures were 700°F and 350°F, respectively. System 4 consists of a laminated structure of Boral and graphite near the primary-shield tank and carbon-block filler. It was calculated to have a maximum temperature of 600°F at the flex plates. The maximum temperature at the flex plates recommended by APDA is 500°F. Energy storage and radiation damage were found to be within permissible limits in all four systems. However, these conclusions are based on experimental data from the Hanford reactor in which the neutron-energy spectrum differs considerably from the PRDC spectrum. A porosity of less than 740 cu ft is required in order that a sodium leak from the core vessel does not expose the core. The voidages in any of the systems mentioned above is about 400 cu ft excluding absorption effects. These are believed to be small. The systems containing Boral were found to be less expensive than the ones using only borated graphite. Over-all material costs range between $230,000 for Boral systems and $350,000 for borated-graphite systems. (auth)

12864 NARF-58-23T

Convair, Fort Worth, Tex.

PARTIAL SHIELD REMOTE MAINTENANCE EXPERIMENT. V. A. Patoski and P. L. Marjon. July 9, 1958. 30p. Project No. 6(1-9964). Contract AF33(600)-32054. (MR-N-214).

An exploratory investigation was made to determine the feasibility of applying the partial shield concept to airplane servicing. The objective of this experiment was to determine the extent of the development effort which would be needed to implement the partial shield concept and to indicate major problem areas. In this experiment, a mechanic using long-handled tools performed several inspection and maintenance tasks on a B-47 airplane from within a partial shield mock-up. It was found that a mobile partial shield can be used at some locations and for some tasks on a contemporary airplane. Although this experiment was quite limited in scope, it showed that partial shields are feasible. Furthermore, experience was gained which will aid in establishing the development requirements for an engineered system. (auth)

12865 NARF-58-24T

Convair, Fort Worth, Tex.

SHIELD SYSTEM OPTIMIZATION: A PARAMETRIC STUDY. R. A. Miller and W. Cranford. June 16, 1958. 34p. Project No. 6(1-9964). Contract AF-33 (600)-32054. (MR-N-207).

In the first application of the gradient nonlinear programming procedure to optimization of the total weight of a divided shield system, a point source was assumed and crew compartment dose rate and reactor leakage constraints were applied. To make the results more realistic, the gradient nonlinear programming procedure was extended so that the effects on shield shape of different locations of a point source and a point detector can be studied. The weight function is minimized subject to a nonlinear dose rate constraint, reactor leakage constraints, and maximum radius constraints—all of which are expressed as linear inequalities. Included here is an outline for the mathematical formulation of the procedure to be used in the numerical computations. (auth)

12866 NDA-Memo-14-28

Nuclear Development Associates, Inc., White Plains, N. Y.

ATTENUATION OF LiH REACTOR SHIELD PLUG. H. Goldstein and R. Aronson. Mar. 9, 1954. Decl. May 28, 1958. 9p.

Work performed under contract with the Detroit Edison Co. and the Dow Chemical Co.

A preliminary calculation was made of the attenuation of neutrons through a lithium hydride shield plug. It has been proposed that a neutron shield be placed

between the reactor core and blanket to prevent the fuel element handling mechanism from becoming so active that it cannot be repaired in case of damage. These approximate results indicate that a plug with a thickness of approximately 70 cm will reduce the neutron current by 10^{-6}. (auth)

12867 UUT-3

Utah. Univ., Salt Lake City.

A DETERMINATION OF HALF-THICKNESS OF ZINC BROMIDE SOLUTION. (DUGWAY PROJECT.) Edward R. Campagna. July 22, 1953. 12p. Contract DA-18-108-CML-4753.

The half-thickness of the concentrated solution of zinc bromide used as shielding material in the windows of the filling cell in Able Area at Dugway Proving Ground was investigated. The average energy of the gamma source used was 1.17 Mev, emitting a collimated beam through beakers containing the zinc bromide in $\frac{1}{8}$ inch fluid increments from 0 to $1\frac{1}{2}$ inches to a Beckman ionization chamber Model MX-4. With all sources of error considered, the half-thickness was determined as 1.85 ± 0.02 inches. (J.R.D.)

12868

GLASS AGAINST RADIATION. Atomics and Nuclear Energy 9, 202-3, 211(1958) June.

Special shielding glass windows are designed to give maximum shielding in minimum thickness, coupled with excellent visibility, resistance to darkening under the action of radiation, and low cost. (auth)

Spectroscopy

12869 NP-6821

Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.

STARK EFFECT ON THE HYPERFINE STRUCTURE OF CESIUM^{133}. Technical Report 322. R. D. Haun, Jr. Jan. 18, 1957. 66p. Project No. 3-99-00-100. Contract DA36-039-sc-64637.

The change of the hyperfine-structure separation energy caused by an electric field has been measured in Cs^{133} by the atomic-beam magnetic-resonance method. The shift of the $(F = 4, m_F = 0) \longleftrightarrow (F = 3, m_F = 0)$ transition frequency (9192.6 mc/sec) caused by electric field $\mathscr{E}$ is given by $\Delta(\mathscr{E}) = -2.29 \times 10^{-6} (1 \pm 0.03)\mathscr{E}^2$ cps, where $\mathscr{E}$ is in volt/centimeter. This number is 2.8 times the value predicted from the atomic polarizability measurements of H. Scheffers and J. Stark, if a simplified theory that neglects hyperfine-structure perturbations of the ground-state wave functions is used. A more precise theory which takes into account these wave-function differences has been outlined but the calculations have not been carried out in detail. (auth)

12870

VIBRATIONAL SPECTRUM OF NICKEL CARBONYL. Llewellyn H. Jones (Los Alamos Scientific Lab., N. Mex.). J. Chem. Phys. 28, 1215-19(1958) June.

The infrared absorption spectrum of $Ni(CO)_4$ has been studied in the liquid and gaseous states. As a result of the observations certain frequency assignment changes have been made. The most probable assignment of fundamental frequencies appears to be 2128 and 381 for the A_1 species; 461 and 79 for the E series; 2057, 459, 422, and 79 for the F_2 species; and 300 cm^{-1} for the F_1 species. Using these values a normal coordinate treatment was carried out. Though the solution is not unique, $F_{CO} = 17.3 \pm 0.4$ md/A and $F_{NiC} \approx 2.1$ md/A. (auth)

12871

INFRARED ABSORPTION SPECTRA OF CHROMYL FLUORIDE AND CHROMYL CHLORIDE. Willard Earl Hobbs (Union Carbide Nuclear Co., Oak Ridge, Tenn.). J. Chem. Phys. 28, 1220-2(1958) June.

The infrared absorption spectra of gaseous chromyl fluoride and gaseous chromyl chloride have been investigated. The region investigated for chromyl fluoride was 2 to 36 μ while that for chromyl chloride was 2 to 25 μ. Six fundamental and nineteen first overtone or binary combination bands have been observed in the spectrum of chromyl fluoride, the fundamental bands being located at 274, 304, 727, 789, 1006, and 1016 cm^{-1}. The observed transitions have been assigned on the basis of a tetrahedral model of C_{2v} symmetry. From the observed spectrum it was possible to estimate the probable positions of the three remaining fundamental bands. The observed spectrum of chromyl chloride included four fundamental bands located at 475, 499, 990, and 1000 cm^{-1} and one first overtone or binary combination band located at 1980 cm^{-1}. (auth)

12872

HIGHER ORDERS OF LONG-PERIOD X-RAY DIFFRACTION IN POLYETHYLENE FIBERS. W. O. Statton (E. I. du Pont de Nemours and Co., Wilmington, Del.). J. Polymer Sci. 28, 423-5(1958) Mar.

Second- and even third-order maxima are reported for meridional long-period diffraction from many oriented, experimental fibers of linear polyethylene. (T.R.H.)

12873

SPECTROMETER FOR FAST NEUTRONS. L. F. Kondrashev, A. A. Kurashev, et al. Pribory i Tekh Ekspt. No. 1, 17-21(1958) Jan. (In Russian)

A telescope is described consisting of four proportional counters with a thin polyethylene radiator used for measuring spectra and neutron flux generated in the target of a half-meter cyclotron. The distance control is accomplished by shifting radiators and aluminum filters which slow down the recoil protons. The spectrometer is used for the investigation of the reaction $T(p,n)He^3$ with 12-Mev protons. (tr-auth)

12874

CRYSTAL REFLECTIVITY IN BENT CRYSTAL SPECTROMETERS. A. J. Cochran and M. A. S. Ross (Royal Military Coll. of Science, Shrivenham and Univ. of Edinburgh). Proc. Phys. Soc. (London) 71, 1011-14 (1958) June.

Previous work on the coefficient of reflection R of bent crystals used in transmission type focusing γ-ray spectrometers has shown a power law dependence on wavelength λ for λ less than 0.5 A. Theory is here presented which suggests that at longer wavelengths the power law does not hold and that R reaches a maximum. The wavelength corresponding to R_{max} depends on the assumptions made about the amount of secondary extinction occurring but could be about 1 A. An experiment on a bent mica crystal shows that R is proportional to $\lambda^{1.9}$ for λ less than 0.5 A and seems to confirm the existence of a maximum near 1 A. (auth)

Theoretical Physics

12875 AECU-3703

RAND Corp., Santa Monica, Calif.

FREE-FREE GAUNT FACTORS. William J. Karzas and Richard Latter. Nov. 8, 1957. 23p. Contract

AT(29-1)-1477. (RM-2010(AEC); AD-156004). $4.80 (ph OTS); $2.70(mf OTS).

The hydrogenic (unscreened coulomb) free-free gaunt factors are computed for a wide range of initial energies and photon frequencies. In addition, an average over initial energies with the Maxwell-Boltzmann distribution is performed to give the temperature-averaged gaunt factors for use in opacity calculations. These are presented as functions of Z^2/kT and $h\nu/kT$. The relation between these gaunt factors and the rate of bremsstrahlung energy production is given, as is the total energy emitted as a function of Z^2/kT. (auth)

12876 NP-6803

Polish Academy of Sciences. Inst. of Nuclear Research, Warsaw.

TESTS FOR TIME REVERSAL INVARIANCE AND FEYNMAN-GELL-MANN THEORY IN ALLOWED BETA TRANSITIONS. Report No. 25/VII. B. Kuchowicz. May 1958. 11p.

Tests for time-reversal invariance and for the two-component theory of Feynman and Gell-Mann are discussed on the basis of allowed beta transitions. Experiments are suggested, in which the electron-neutrino angular correlation and electron polarization are to be measured simultaneously. Coulomb effects have been taken into account. (auth)

12877

ON THE CONNECTION OF SPIN WITH STATISTICS. N. Burgoyne (Inst. for Theoretical Physics, Copenhagen). Nuovo cimento (10) 8, 607-9(1958) May 16.

The relation between spin and statistics is proved using only the most general assumptions. (auth)

12878

THE HIGH ENERGY LIMIT OF THE POTENTIAL SCATTERING. II. RELATIVISTIC KINEMATICS. M. Verde (Univ. of Turin). Nuovo cimento (10) 8, 560-8(1958) May 16.

The asymptotic expansions of the scattering amplitude at high energy obtained previously for a Schrödinger equation of motion are extended to the cases of a Dirac and Klein-Gordon particle. The method followed is based on the extension of the so called Gel'fand and Levitan operator which gives a uniform connection of two complete bases in the Hilbert space. A compact expression for the general term of the expansion is found. This allows its evaluation by means of recurrence relations. (auth)

12879

CHARGE CONSERVATION IN THE BETHE-SALPETER EQUATION. G. R. Allcock and D. J. Hooton (Univ. of Liverpool). Nuovo cimento (10) 8, 590-8(1958) May 16.

The scalar product between two bound states is expressed in terms of a conserved charge and reduced to a standard covariant form. (auth)

12880

STATISTICS OF THE ISING FERROMAGNET. Alfred Levitas (Syracuse Univ., N. Y.) and Melvin Lax (Bell Telephone Labs., Murray Hill, N. J.). Phys. Rev. 110, 1016-27(1958) June 1.

The model of ferromagnetism proposed by Ising is treated by synthesizing a cluster treatment with the spherical model. The spherical model is used to determine approximately the molecular field acting on the cluster and the effective interactions between dipoles of the cluster. The method is applied to the square net and to the cubic lattice, and the critical temperatures are obtained. The result for the square net is that $E/kT_c = 0.831$ and for the cubic lattice that $E/kT_c = 0.442$. In these results E is the energy required to change an adjacent pair of dipoles from parallel to antiparallel relative orientation. (auth)

12881

APPROXIMATE WAVE FUNCTIONS FOR THE GROUND STATE OF HELIUM. R. K. Nesbet (Boston Univ.) and R. E. Watson (Massachusetts Inst. of Tech., Cambridge). Phys. Rev. 110, 1073-6(1958) June 1.

Approximate ^1S electronic wave functions for the ground state of the helium atom have been obtained by the method of superposition of configurations. Parameters determining the radial factors of orbitals, with spherical harmonic angular factors up to $l = 3$, were varied to minimize the calculated energy. For each choice of the ten parameters varied in this way, a complete calculation was carried out, involving the construction and diagonalization of the twenty-by-twenty configuration interaction matrix obtained from all independent ^1S functions determined by the ten independent orbital radial factors. The best energy obtained was -2.90276 atomic units, differing from the experimental value by 0.001 atomic unit. (auth)

12882

VARIATIONAL WAVE FUNCTION FOR NUCLEAR MATTER. Manuel Rotenberg and Lawrence Wilets (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 110, 1126-30(1958) June 1.

A variational wave function for large nuclear systems is proposed. The function is written as a product of plane wave and deuteron-like functions. The exclusion principle is conveniently introduced by explicitly cutting out overlap between the plane wave and pair states in a manner equivalent to antisymmetrization. The method is limited to nonsingular potentials. Numerical calculations with saturating Yukawa potentials yield a correlation energy of 1.1 Mev per particle at low density, decreasing with increasing density. The method of introduction of the exclusion principle is applied to a qualitative discussion of elastic scattering by a complex projectile, e.g., an alpha particle. The distortion of the projectile wave function due to the exclusion of low-momentum components reduces the depth of an effective optical potential with respect to the sum of the potentials seen by the component nucleons. (auth)

12883

ENUMERATION OF THE TRUE OBSERVABLES IN GAUGE-INVARIANT THEORIES. James L. Anderson (Stevens Inst. of Tech., Hoboken, N. J.). Phys. Rev. 110, 1197-9(1958) June 1.

By making use of invariance arguments, it is shown that the total number of true observables which can serve as "coordinates" in a gauge-invariant theory is $N-2n$ where N is the number of field variables and n is the number of arbitrary functions needed to specify an element of the gauge group. (auth)

12884

GENERAL COVARIANCE AND ELEMENTARY PARTICLES. R. Finkelstein (Univ. of California, Los Angeles). Phys. Rev. 110, 1200-3(1958) June 1.

It is suggested that quantization of the generally covariant field equations be carried out in an associated six-dimensional flat space, and that the corresponding eight-rowed spinor be identified with an elementary baryon. It is possible to associate with the new dichotomic variable two (nonorthogonal) states, one of parity and one of strangeness. (auth)

12885

ADDENDUM TO SPIN, STATISTICS, AND THE TCP THEOREM. Julian Schwinger (Harvard Univ.,

Cambridge, Mass.). Proc. Natl. Acad. Sci. U. S. 44, 617-19(1958) June.

In the preceding paper (Proc. Natl. Acad. Sci. U. S. 44, 223(1958)) the single physical requirement of the existence of a vacuum state was used to exclude Fermi-Dirac fields with integer spin and Bose-Einstein fields of half-integer spin. In the addendum it is shown that while it is desirable to unify the treatment of all fields, the avoidance of explicit reference to commutation properties cannot be explicitly maintained. (L.T.W.)

12886

DISPERSION RELATIONS FOR VIRTUAL PROCESSES. A. A. Logunov (Joint Nuclear Research Inst.). Soviet Phys. (Doklady) 2, 540-2(1957) Nov.-Dec.

Dispersion relations can be determined for vertex parts—"units" in the matrix elements of processes. Dispersion relations are obtained for the photoproduction "unit" in the case $k^2 \leq 0$, and these relations, as in the case of real photoproduction, can be used to obtain approximate equations. (J.S.R.)

12887

RADIATION CORRECTIONS TO PARTICLE SCATTERING IN EXTERNAL FIELD AND TO COMPTON EFFECT IN SCALAR QUANTUM ELECTRODYNAMICS. V. F. Aleksin and D. V. Volkov (Physico-Tech. Inst., Academy of Sciences, Ukrainian SSR). Soviet Phys. JETP 6, 803-4(1958) Apr.

The expression for the single-photon mass operator of a scalar particle was used to calculate the radiation corrections to the Compton effect and to the scattering of a scalar particle in an external electromagnetic field. The expressions obtained for the differential cross section are given. (J.S.R.)

12888

CONCERNING A SYMMETRY PROPERTY OF THE NEW GELL-MANN THEORY. Chou Guan-Chao (Joint Inst. for Nuclear Research). Soviet Phys. JETP 6, 815-16(1958) Apr.

The Hamiltonian of the interaction with π mesons in the new Gell-Mann theory is written. By making appropriate substitutions, the author shows that in addition to the global symmetry there exists another symmetry property even in the absence of K coupling. This symmetry property provides one with selection rules for certain processes. Processes in which there are only π mesons and photons in the initial and final states are considered. (J.S.R.)

12889

ON THE THEORY OF SUPER FLUIDITY OF BOSE AND FERMI SYSTEMS. N. N. Bogolyubov. Vestnik Akad. Nauk S.S.S.R. 28, No. 4, 25-36(1958) Apr. (In Russian)

The low-energy spectra of Bose-gas excitations were studied by a specially developed method of canonical transformations. The same generalized method was applied for the development of the theory of superconductivity and studies of superfluidity of the Fermi system. (R.V.J.)

Uranium and Uranium Compounds

12890 AECD-4265

Carbide and Carbon Chemicals Co. [K-25 Plant], Oak Ridge, Tenn.

U-235 CRITICAL MASS DEPENDENCE ON MODERATION. A. D. Callihan, Hugh F. Henry, and R. L. Macklin. Sept. 22, 1952. Decl. with deletions June 3, 1958. 6p. Contract [W-7405-eng-26]. (KS-315(Del.)). $1.80(ph OTS); $1.80(mf OTS).

Based on experimental data and on conservative theoretical considerations, an estimate has been made of the relation of the minimum U-235 critical mass to the hydrogen moderation for uranium material at the U-235 assays for which experimental information is available. These estimates have been used in indicating maximum safe amounts for conditions where definite moderation limitations can be established. (auth)

12891 AERE-M/R-2526

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THERMAL CONDUCTIVITY OF UO_2. R. Scott. Mar. 1958. 13p.

An experimental measurement of the thermal conductivity of stoichiometric UO_2 of 96% theoretical density, over the range 800 to 1150°C, is described. The results are considered in conjunction with previous measurements, and it is concluded that the expression $K = \frac{10}{T + 400}$ cal (cm sec °C)$^{-1}$, where T is the temperature in °C, represents the thermal conductivity of UO_2 of theoretical density. Irradiation data for UO_2 are not inconsistent with the value $K = \frac{8D}{T + 400}$. The behavior of UO_2 cylindrical rods under thermal stress is considered, and it is shown that a temperature difference in excess of 150°C between the surface and axis will cause cracking. (auth)

12892 IGR-TN/C-855

United Kingdom Atomic Energy Authority. Industrial Group. Culcheth Labs., Culcheth, Lancs, England.

NON EQUILIBRIUM BETA RETENTION IN FUEL ELEMENTS. R. B. Kahoe. 1958. 8p.

It was suggested that the irradiation swelling of uranium in the beta phase may be less than that at high temperatures in the alpha phase, owing to the greater strength of the beta phase. During irradiation of uranium at an alpha temperature small volumes are raised by the fission heating to the beta phase, and if the induction time for reversion to the alpha phase is sufficiently long a high proportion of the fuel may at any moment be in the beta phase. An attempt to calculate what order of induction period would be needed is presented and the conditions under which the scheme might be successful are discussed. (auth)

12893 LA-2203

Los Alamos Scientific Lab., N. Mex.

CRITICAL MASSES OF ORALLOY IN THIN REFLECTORS. G. E. Hansen, H. C. Paxton, D. P. Wood, K. W. Gallup, and R. H. White. Jan. 1958. 33p. Contract W-7405-eng-36. $6.30(ph OTS); $3.00(mf OTS).

Critical masses were measured for 5.25 in. diameter Oy cylinders in 0.5 and 1 in. thick reflectors of Be, graphite, Mg, Al, Ti, mild steel, Cu, W alloy, Tu, Ni, Co, Mo, Al_2O_3, Mo_2C, and polythene. These results were converted to the equivalent spherical critical masses of Oy and compared to yield consistent transport cross sections for the reflector materials. In addition, critical masses of Oy spheres in ~2 and ~4 in. thick spherical reflectors of W alloy, Fe, Ni, Ni-silver, Cu, Zn, Th, Be, BeO, C, and Tu were determined. (auth)

12894 NDA-Memo-14-65

Nuclear Development Associates, Inc., White Plains, N. Y.

PROBLEM OF LOW MELTING POINT EUTECTICS AT FUEL ELEMENT INTERFACE. R. A. Daane. Jan. 14, 1955. Decl. July 7, 1958. 9p.

Work performed under contract with the Detroit Edison Co. and the Dow Chemical Co.

The effects of low-melting-point U–Fe or U–Ni eutectics being formed at the interface of U–Cr and U–Zr fuel alloys in the proposed APDA reactor are discussed. From the temperature distribution it appears that the low-melting-point eutectics at the fuel element interface will not cause any damage to the reactor fuel elements. (R.V.J.)

12895 ORNL-2127(Pt. II(Vols. 1 and 2))
Oak Ridge National Lab., Tenn.
URANIUM-235 FISSION-PRODUCT PRODUCTION AS A FUNCTION OF THE THERMAL NEUTRON FLUX, IRRADIATION TIME, AND DECAY TIME. II. SUMMATIONS OF INDIVIDUAL CHAINS, ELEMENTS, AND THE RARE-GAS AND RARE-EARTH GROUPS. VOLUMES 1 AND 2. J. O. Blomeke and Mary F. Todd. (Vol. 1, Dec. 19, 1957. 363p. and Vol. 2, June 10, 1958. 365p.). Contract W-7405-eng-26. (Vol. 1, $6.50(OTS) and Vol. 2, $5.00(OTS)).

These two volumes were issued separately, but are cataloged as a unit.

The following properties, per initial atom of U^{235}, are tabulated for each fission-product chain with mass number 72 to 161: activity, gamma power, total power, poisoning, and gamma disintegrations per second with energies up to 1.70 Mev. (M.H.R.)

12896
VARIATION OF THE SPECIFIC WEIGHT OF URANIUM AFTER COLD WORKING AND DURING ANNEALING. Jean-Pierre Mustelier. Compt. rend. 246, 3347-50 (1958) June 16. (In French)

The density of some uranium samples was measured by the hydrostatic pressure method before and after cold working. One sample was then annealed at increasing temperatures with a temperature measurement after each anneal. The density variations brought about by the cold working and annealing are interpreted by the formation and disappearance of defects in the metal. (auth)

12897
PREPARATION OF ARC-MELTED URANIUM CARBIDES. R. J. Gray, W. C. Thurber, and C. K. H. DuBose (Oak Ridge National Lab., Tenn.). Metal Progr. 74, No. 1, 65-70(1958) July.

Arc-melted uranium carbides are prepared for aluminum reactor fuel elements in which the U^{235} enrichment is limited to 20%. Aluminum–uranium carbide fuel plates, fabricated by the picture frame technique, retain their dimensional tolerance during heat treatment. Microstructures in color and in black and white were studied in detail. (auth)

NUMERICAL INDEX OF REPORTS

This is a list of reports abstracted in this issue of *Nuclear Science Abstracts*, with the corresponding abstract number reference.

The report number codes listed below apply to AEC reports unless otherwise designated. Other codes are listed as British, Canadian, or Non-AEC. Those codes marked Misc. are used for both AEC and non-AEC reports. For a complete description of all report number codes used by the AEC, see TID-85, *Report Number Series Used by the Technical Information Service in Cataloging Reports*. September 1957. 112p. $3.00 (OTS). Some reports appear under more than one code designation and wherever practical all report numbers are listed in this index.

Report No.	Abstract No.
ACNP	
5808	12-12684
AD (Misc.)	
134699	12-12144
135136	12-12717
136006	12-12862
136422	12-12476
140340	12-12848
151194	12-12414
154198	12-12401
154260	12-12480
154261	12-12480
154262	12-12480
155523	12-12248
156004	12-12875
158307	12-12567
158352	12-12818
AE (Non-AEC)	
1	12-12681
2	12-12682
AEC-tr	
3221	12-12418
3247	12-12805
3257	12-12824
3260	12-12660
3264	12-12455
3266	12-12456
3267	12-12222
3279	12-12577
3281	12-12825
3283	12-12806
3291	12-12560
3292	12-12561
3295	12-12457
3297	12-12419
3298	12-12350
3302	12-12387
3308	12-12223
AECD	
4253	12-12683
4265	12-12890
4267	12-12307
4268	12-12331
AECL (Canadian)	
647	12-12121
AECU	
3513	12-12782
3696	12-12641
3703	12-12875
3704	12-12684
3754	12-12797
3757(Pt. 1)	12-12685
3757(Pt. 2)	12-12685
3759	12-12319
3760	12-12554
3761	12-12555
3762	12-12398
3763	12-12686
3765	12-12479
AECU	
3766	12-12367
3768	12-12533
3770	12-12399
3771	12-12345
3772	12-12308
3773	12-12346
3776	12-12687
AERE-C (British)	
R-717	12-12249
R-2407	12-12249
R-2583	12-12143
AERE-CE (British)	
R-2052	12-12332
R-2497	12-12353
AERE-EL (British)	
M-103	12-12512
AERE-Lib/Trans (British)	
675	12-12807
774	12-12759
781(MS 1 and 2)	12-12224
783	12-12420
784	12-12578
AERE-M (British)	
R-2510	12-12400
R-2526	12-12891
AERE-Med (British)	
M-22	12-12250
AERE-R (British)	
R-2395	12-12354
R-2418	12-12688
R-2484	12-12513
R-2501	12-12632
R-2537	12-12689
R-2558	12-12390
AERE-T (British)	
M-162	12-12276
R-221	12-12691
R-239	12-12633
R-1347	12-12489
R-1859	12-12491
R-2503	12-12490
R-2519	12-12798
AERE-TP (British)	
R-2374	12-12491
AFOSR-TN (Non-AEC)	
57-432	12-12476
58-355	12-12480
58-356	12-12480
58-357	12-12480
58-497	12-12567
58-536	12-12818
AFOSR-TR (Non-AEC)	
58-48	12-12401
AFSWC-TN (Non-AEC)	
57-22	12-12144
AMF-GR (Misc.)	
6-57	12-12692
ANL	
4469(Del. 2)	12-12215
5452	12-12693
5566	12-12694
5823	12-12819
5863	12-12286
5864	12-12799
5869	12-12626
ANU (Non-AEC)	
P-184	12-12568
P-185	12-12783
APAE	
34(Vol. I)	12-12695
34(Vol. II)	12-12695
34(Vol. III)	12-12695
APAE-Memo (Misc.)	
115	12-12696
APEX (Misc.)	
373	12-12556
382	12-12697
ARC (British)	
18062	12-12443
ARC-CP (British)	
291	12-12443
ARDE(M) (British)	
24/57	12-12862
BAW	
1002	12-12698
1003	12-12699
1006	12-12699
1010	12-12699
1013	12-12700
1018	12-12700
1020	12-12700
1026	12-12701
1028	12-12701
1029	12-12701
BMI (Misc.)	
514	12-12402
532	12-12403
1270	12-12216
1271	12-12382
1272	12-12404
BMI-APDA	
622	12-12863
BNL	
325(2nd. Ed.)	12-12658
496	12-12110
3247	12-12702
3323	12-12150
3441	12-12186
3525	12-12789
3526	12-12791
3529	12-12462
3530	12-12856
3553	12-12482
3574	12-12666
3575	12-12638
3580	12-12840
BNL	
3621	12-12815
3637	12-12211
BRL (Non-AEC)	
678	12-12372
BW (Misc.)	
5423	12-12355
CD (Canadian)	
460	12-12333
CEA (Non-AEC)	
711	12-12661
712	12-12662
714	12-12565
724	12-12703
726	12-12217
729	12-12492
740	12-12704
CENC	
1002	12-12705
CERN (Non-AEC)	
58-5	12-12800
58-9	12-12801
58-10	12-12802
58-12	12-12803
CF (Oak Ridge National Lab.)	
54-8-207	12-12706
54-9-25	12-12707
55-5-32	12-12708
57-2-20(Del.)	12-12343
57-5-31	12-12709
57-6-23	12-12344
57-6-87	12-12742
57-10-46(Suppl.)	12-12368
58-2-144	12-12710
58-4-10	12-12711
58-4-23	12-12356
58-5-67	12-12357
58-5-110	12-12347
58-5-116	12-12444
58-6-17	12-12712
58-6-74	12-12383
58-6-92	12-12384
58-6-111	12-12713
58-6-112	12-12714
58-7-36	12-12715
COO	
240	12-12716
CRB (Canadian)	
785	12-12121
CRDC (Canadian)	
718	12-12849
CWLR (Non-AEC)	
2222	12-12569
CWR	
400-4	12-12820
400-5	12-12821
496	12-12822
DP	
276	12-12278

Report No.	Abstract No.
EES (Non-AEC)	
040126	12-12717
EM (Misc.)	
1202	12-12848
ERI (Misc.)	
2031-1-P	12-12685
2031-2-P	12-12685
GAT-L	
284	12-12351
GAT-R	
34	12-12161
GEAP	
0974	12-12570
GEH	
23146	12-12398
GPI (Canadian)	
42	12-12571
HARD(A) (British)	
P-48	12-12689
HW	
40990	12-12373
47578	12-12145
48800(Rev.)	12-12718
51856	12-12445
53621	12-12405
54553	12-12572
54637	12-12719
54947(Rev.)	12-12573
55172	12-12473
55460	12-12218
55879	12-12642
56096	12-12309
I (Misc.)	
A2049-2	12-12345
A2049-3	12-12346
IDO	
14316(Suppl. 3)	12-12251
16460	12-12720
IGR-TN (British)	
C-855	12-12892
C-888	12-12446
INSJ (Non-AEC)	
10	12-12574
INTERNUC (Misc.)	
4	12-12721
22	12-12722
ISC	
771	12-12146
848	12-12439
952	12-12326
978	12-12348
K	
1325(Condensed)	12-12871
1336	12-12322
KAPL	
1611(Del.)	12-12723
1843	12-12552
1890	12-12252
KAPL-A	
ME-1	12-12406
KLX	
1782	12-12724
KS	
315(Del.)	12-12890
KT	
339(Del.)	12-12307
LA	
2203	12-12893
LTRS (British)	
RM-314	12-12287
M (Misc.)	
6385	12-12331
MAB (Non-AEC)	
129-M	12-12407
ML (Misc.)	
379	12-12808
388	12-12797
MR-N (Non-AEC)	
207	12-12865
214	12-12864
MURA (Misc.)	
360	12-12557
NAA-SR	
2689	12-12725
NAA-SR-Memo	
456(Del.)	12-12726
1822	12-12727
NARF (Non-AEC)	
58-23T	12-12864
58-24T	12-12865
NDA (Misc.)	
14-153	12-12729
14-170	12-12730
014-180	12-12728
NDA-Memo	
14-28	12-12866
14-65	12-12894
NMI	
1157	12-12385
NLCO	
731	12-12335
NP (AEC File No. for Non-AEC Reports)	
6633	12-12731
6778	12-12122
6791	12-12502
6794	12-12605
6795	12-12106
6796	12-12349
6800	12-12253
6801	12-12643
6803	12-12876
6804	12-12254
6805	12-12107
6806	12-12447
6807	12-12558
6808	12-12448
6809	12-12324
6811	12-12369
6813	12-12219
6814	12-12220
6815	12-12575
6816	12-12449
6818	12-12477
6819	12-12408
6821	12-12869
6822	12-12115
6825	12-12116
6828	12-12514
NP-tr (AEC File No. for Non-AEC Translations)	
105	12-12328
NRL (Misc.)	
5143	12-12627
NRL-Memo (Non-AEC)	
803	12-12716
NYO	
4746	12-12108
7607	12-12227
7930	12-12450
7981	12-12493
8085	12-12377
8582	12-12621
ORNL (Oak Ridge National Lab.)	
2127(Pt. 2)(Vol. I)	12-12895
2127(Pt. 2)(Vol. II)	12-12895
2443	12-12310
2456	12-12634
2483	12-12515
2489	12-12255
2492	12-12534
2518	12-12732
2524	12-12409
ORNL (Oak Ridge National Lab.)	
2529	12-12321
2535	12-12784
2537	12-12370
PRDC-TR	
10	12-12733
11	12-12734
RM (Misc.)	
2010(AEC)	12-12875
RME	
3143	12-12334
SCL-T	
175	12-12519
189	12-12629
SCR	
22	12-12559
23	12-12451
24	12-12452
25	12-12516
26	12-12375
27	12-12628
28	12-12517
29	12-12518
30	12-12494
42	12-12378
SCTM	
133-56(16)	12-12518
139-58(16)	12-12453
187-58(51)	12-12850
SPM (Non-AEC)	
246	12-12735
SWP/P (British)	
47	12-12690
TEI	
641	12-12393
TID	
7521(Pt. 1)(Del.)	12-12410
7521(Pt. 1)(Del.) (p. 3-12)	12-12411
7521(Pt. 1)(Del.) (p. 13-55)	12-12412
7521(Pt. 1)(Del.) (p. 56-99)	12-12413
7549(Pt. 2)	12-12736
7549(Pt. 2)(p. 1-6)	12-12737
7549(Pt. 2) (p. 7-13)	12-12738
7549(Pt. 2) (p. 13-26)	12-12739
7549(Pt. 2) (p. 27-30)	12-12740
7549(Pt. 2)(p. 31)	12-12741
7549(Pt. 2) (p. 32-43)	12-12742
7551	12-12147
7551(p. 1-4)	12-12148
7551(p. 5-8)	12-12149
7551(p. 8-16)	12-12150
7551(p. 17-23)	12-12151
7551(p. 23-4)	12-12152
7551(p. 24-6)	12-12153
7551(p. 26-8)	12-12154
7551(p. 28-9)	12-12155
7551(p. 30-1)	12-12156
7551(p. 32-3)	12-12157
7551(p. 33-5)	12-12158
7551(p. 35-40)	12-12159
7551(p. 40)	12-12160
7551(p. 41-3)	12-12161
7551(p. 44-5)	12-12162
7551(p. 45-6)	12-12163
7551(p. 47-50)	12-12164
7551(p. 50-2)	12-12165
7551(p. 53-65)	12-12166
7551(p. 65-7)	12-12167
TID	
7551(p. 67-84)	12-12168
7551(p. 84-91)	12-12169
7551(p. 91-2)	12-12170
7551(p. 92-7)	12-12171
7551(p. 98-107)	12-12172
7551(p. 108)	12-12173
7551(p. 109-13)	12-12174
7551(p. 114-19)	12-12175
7551(p. 120-9)	12-12176
7551(p. 130-2)	12-12177
7551(p. 133-9)	12-12178
7551(p. 140-59)	12-12179
10078	12-12743
UCLA	
418	12-12301
UCRL	
3070	12-12804
3888	12-12644
4973	12-12270
5011	12-12235
5161	12-12245
5189-T	12-12229
5210	12-12454
5212	12-12507
5213	12-12508
5214	12-12358
5234-T	12-12504
5263	12-12823
8051	12-12601
8086	12-12325
8173	12-12530
8210	12-12119
8223	12-12785
8289	12-12659
8295	12-12576
8301	12-12619
8312	12-12842
8313	12-12329
UR	
520	12-12117
USBM-C (Misc.)	
172	12-12858
UUT (Non-AEC)	
3	12-12867
UVAR (Non-AEC)	
3 and amendment	12-12744
WADC-TN (Non-AEC)	
58-58	12-12248
WADC-TR (Non-AEC)	
54-270(Pt. 3)	12-12414
WAPD-BT	
7	12-12221
WAPD-PA	
145	12-12745
WAPD-PC	
166	12-12746
263	12-12747
WAPD-PM	
12	12-12635
WAPD-PMM	
185	12-12753
WAPD-PWR	
PC-1015	12-12748
PC-1057	12-12749
PCR-197	12-12750
PMF-350	12-12751
PMF-999	12-12752
PMM-889	12-12754
(RD-1)-194	12-12755
WAPD-T	
275	12-12336
624(Rev.)	12-12756
WAPD-TH	
391	12-12359

Report No.	Abstract No.	Report No.	Abstract No.	Report No.	Abstract No.	Report No.	Abstract No.
WAPD-TM (Misc.)		WCAP		WIN		WT	
81	12-12415	216	12-12279	36	12-12312	1191	12-12111
123	12-12386	WIAP		38	12-12313	XDC	
132	12-12416	8	12-12757	44	12-12314	58-5-84	12-12556
WAPD-ZH		WIN		64	12-12315	YAEC	
8	12-12417	35	12-12311	90	12-12337	79	12-12758

PERSONAL AUTHOR INDEX

This is an index for the reports abstracted in this issue. For each reference the number preceding the dash is the volume number and the number after the dash is the abstract number. Personal author indexes are cumulated on a semiannual and annual basis.

A

ABBOTT ROBERT C
12-12483
ABRAGAM ANATOLE
12-12661
ACCOMTIUS O E
12-12403
ACKERMAN M E
12-12592
ADAM J
12-12328 12-12420
ADLEY F E
12-12167
AFANASEV V P
12-12553
AGARWAL S P
12-12478
AGLINTSEV K K
12-12587
AGNEW LEWIS E JR
12-12672
AKSENOV G I
12-12438
ALBURGER D E
12-12666
ALDER B J
12-12454
ALDERMAN JAMES O
12-12144
ALEKSEEV P P
12-12629
ALEKSEEVA K I
12-12655
ALEKSIN V F
12-12887
ALLAN A P JR
12-12163
ALLCOCK G R
12-12879
ALLEN HARRY C JR
12-12285
ALLEN J S
12-12852
ALLEN P J
12-12337
ALLEN W D
12-12846
ALLISON G M
12-12849
ALLTON E A
12-12611
AMMANN R R
12-12307
AMOS J C
12-12956
AMOUYAL A
12-12735
ANDELFTT C R
12-12374
ANAMEV F P
12-12767
ANDERS OSWALD U
12-12782
ANDERSON DAVID M
12-12179
ANDERSON I C
12-12211
ANDERSON J M
12-12326
ANDERSON JAMES L
12-12883
ANDERSON JESS
12-12557
ANDERSON L C
12-12295
ANDERSON PHILIP D
12-12427
ANDERSON W KERMIT
12-12779
ANDREW F R
12-12544
ANDREWS L J
12-12333
ANGELE GUSTAVE J
12-12352
ANLIOT P
12-12769
ANTONOV A V
12-12810
ARAMAN F
12-12535
ARIFOV U A
12-12678
ARNOLD E D
12-12343
ARNOUS E
12-12563
ARONSON R
12-12866
ASHIMUMA KAN-ICHI
12-12423
ASHTON F
12-12594
ASIMOW R
12-12401
ASPERGER SMILJKO
12-12772
ATTREE R W
12-12281
AUERBACH CHARLOTTE
12-12120
AULL L R
12-12787
AUSTIN ALFRED E
12-12404
AUXIER J A
12-12583
AVAKYANTS G M
12-12824
AVERY A F
12-12690
AYUKHANOV A KH
12-12678
AZOU PIERRE
12-12425

B

BAILLY R
12-12704
BAINBRIDGE I F
12-12436
BAKANOV S P
12-12474
BAKER A R
12-12832
BAKER BURTON L
12-12133
BAKER P S
12-12534
BALDIN A
12-12608
BALDWIN E F
12-12406
BALL S J
12-12711
BALLOU JOHN F
12-12212
BANASHEK YE I
12-12226
BANIC G M
12-12550
BARANGER ELIZABETH
12-12674
BARANOV V I
12-12264 12-12395
BARBER E J
12-12341
BARBIER M
12-12800
BARGH K A
12-12602
BARLOUTAUD ROLAND
12-12662
BARNES R S
12-12400
BARNOTHY J M
12-12187
BARNOTHY M F
12-12187
BARRETT C S
12-12463
BARTNOFF S
12-12772
BARTON C J
12-12340
BARTON M O
12-12790
BASSETT H W JR
12-12768
BASTIEN PAUL
12-12425
BATE R R
12-12708
BATES D R
12-12676
BAUER S H
12-12236 12-12502
BAUR WERNER H
12-12681
BAYER RAYMOND
12-12437
BAZ A I
12-12657 12-12847
BEACH L A
12-12716
BEAN K E
12-12575
BEARD G B
12-12567
BEAUCHAMP E E
12-12534
BEELER J R
12-12556
BEHRENS D J
12-12633 12-12691
BELL W A JR
12-12550
BELOKUROVA I N
12-12379
BELONOGOV A V
12-12598
BENNETT J A P
12-12559
BENOIST P
12-12735
BEREZNYAK N G
12-12655
BERLOVICH E E
12-12523 12-12524
BERNER R R
12-12850
BERRY WARREN E
12-12216 12-12382
BESYADOVSKII E A
12-12629
BETIN YU P
12-12599
BEVINGTON J C
12-12327
BEVIS K S
12-12223
BILLINGS A M
12-12776
BILLINGS CHARLES E
12-12171 12-12175
12-12176 12-12177
BINDER IRA
12-12302
BINFORD F T
12-12709
BIRD LEONARD
12-12569
BIRKHOFF R D
12-12321 12-12584
BISHOP C E
12-12444
BISWAS N N
12-12609
BLACK D G
12-12403
BLAIR H A
12-12140
BLINOV G A
12-12597
BLOCK R P
12-12333
BLOMEKE J O
12-12344 12-12895
BLOOM H J G
12-12125
BLOOM STEWART D
12-12504 12-12815
BOEDEGE RUDOLF
12-12680
BOEHM F
12-12854
BOGHEN JACQUES
12-12424
BOGOLYUBOV N N
12-12889
BOHN JACK R
12-12371
BOLGER J C
12-12710
BOLLINGER L M
12-12794
BOLTON P R
12-12156
BOND V P
12-12136
BONDELID R O
12-12664
BONFIGLIOLI GUIDO
12-12480
BOON M H
12-12490
BOOTH H E
12-12369
BORASKY R
12-12473
BORG D C
12-12604
BORTNER T E
12-12503
BOTNER W T
12-12451
BOULDEN G P
12-12705
BOWEN THEODORE
12-12618
BOZORTH R M
12-12305
BRANDT WERNER
12-12826
BREIDENBACH HAROLD I
12-12372
BRENNAN JAMES T
12-12141
BRENNAN JOHN E
12-12766
BRENT ROBERT L
12-12132
BRESLIN A J
12-12196
BRETON C
12-12492
BRITTAN R O
12-12738
BRODY H M
12-12616
BROVETTO PIERO
12-12480
BROWN G E
12-12652
BROWN J
12-12446
BROWN K R
12-12310
BROWN ROBERT M
12-12150
BRUK B I
12-12419
BRULEY D
12-12715
BRYAN R A
12-12843
BRYANT F J
12-12143
BUB ROBERT A
12-12164
BUCK W ROGER
12-12388
BUDZYNSKI A Z
12-12254
BULKOWSKI H H
12-12402
BULLWINKEL E P
12-12338 12-12339
BUNCE J L
12-12249
BUNEMAN O
12-12497
BURDE J
12-12535
BUREK J
12-12397
BURGDORFER ALBERT
12-12345
BURGOYNE N
12-12877
BURGY M T
12-12639

BURMAN R L
12-12852
BURMISTROV V R
12-12578
BURREN J W
12-12798
BURTT BENJAMIN P
12-12291 12-12293
BUSH WILLIAM R
12-12468
BUTLER J W
12-12664

C

CADY HOWARD H
12-12320
CAIN F M JR
12-12336
CAINE C A
12-12654
CALKINS GEORGE D
12-12775
CALLIHAN A D
12-12890
CALVIN M
12-12325
CAMERON A E
12-12550
CAMPAGNA EDWARD P
12-12867
CAMPBELL I E
12-12402 12-12403
CAMPBELL I G
12-12254
CAPETTO A A
12-12789 12-12791
CARPENTER R T
12-12794
CARTER M W
12-12198
CARTER T C
12-12128
CECCARELLI M
12-12609
CELLI F J
12-12107
CHAPIN DOUGLAS S
12-12271
CHAPPELL DAVID G
12-12831
CHAR T L RAMA
12-12431
CHARON J
12-12492
CHASE D M
12-12834
CHASTAIN JOEL W
12-12863
CHATTERS R M
12-12158
CHEKA J S
12-12584
CHERNOBYLSKIY I I
12-12360
CHERNOV N N
12-12528
CHIRIGOS J N
12-12741
CHIU HONG-YEE
12-12838
CHMIELEWSKI W S
12-12722
CHRISTIAN R H
12-12454
CHUBB WALSTON
12-12775
CHUKHLANTSEV V G
12-12342
CHURCH A JR
12-12331
CHURCHMAN A T
12-12400
CHUVATIN S A
12-12500
CLAIBORNE H C
12-12712
CLARE J W H
12-12430 12-12433
CLARKE W G
12-12689
CLAUS WALTER D
12-12183
CLAUSS AUGUSTE
12-12421
CLEARY H J
12-12385
CLIFFORD W E
12-12339
COCHRAN A J
12-12874
COCHRAN LEWIS W
12-12827
COEN I H
12-12758
COHEN E R
12-12726
COHN S H
12-12202
COLE LEONARD J
12-12190
COLEMAN C F
12-12310
COLEMAN JOHN H
12-12514
COLLINS P
12-12578
COMBRISSON JEAN
12-12661
CONARD ROBERT A
12-12142
CONGDON CHARLES C
12-12188 12-12192
CONNICK ROBERT E
12-12320
COOKE F W
12-12347
CORNWELL P B
12-12129
CORRIGAN S J B
12-12510
CORTESE CESARE
12-12480
COSDEN T H
12-12627
COTTRELL A H
12-12400
COURCON JANINE
12-12191
COWAN E P
12-12110 12-12186
CRANFORD W
12-12865
CREEK GEORGE E
12-12742
CROCKET DAVID S
12-12274
CROCKETT D J
12-12125
CROUSE D J
12-12310
CUMMING JAMES B
12-12856
CUNNINGHAM CLARENCE M
12-12271
CUNNINGHAM J E
12-12332
CURCIO J A
12-12627
CUSHING R L
12-12281

D

DAANE R A
12-12894
DAHL HARRY M
12-12396
DANCEWICZ A
12-12122
DANDL R A
12-12562
DANZ W
12-12457
DASH J G
12-12282
DAVEY C N
12-12512
DAVEY W G
12-12632
DAVIDSON LEON
12-12729
DAVIS R J
12-12384
DAY E A
12-12814
DE LAGUNA WALLACE
12-12344
DE SWART J J
12-12843
DEARBORN E G
12-12304
DELICATE W S
12-12722
DELLAVALLE J M
12-12444
DENNEY DONALD R
12-12540 12-12541
DENNIS RICHARD
12-12171 12-12178
DERYAGIN B V
12-12474
DESSLER A J
12-12469
DEVLIN G E
12-12485
DEWIRE J W
12-12613
DINGEE DAVID A
12-12863
DIPIETRO W P
12-12746
DOHERTY DAVID G
12-12233
DOLE M
12-12296
DONTSOV YU P
12-12860
DRESDNER R D
12-12230
DRYDEN C E
12-12403
DUBOIS R CLARK
12-12532
DUBOSE C K H
12-12897
DUCLOS J
12-12589
DUFF R E
12-12236
DUFF RUSSELL E
12-12459
DUGDALE R A
12-12690
DUNNING DONALD N
12-12779
DUNNING GORDON M
12-12112 12-12136
12-12137 12-12138
12-12139 12-12140
12-12141 12-12142
12-12195 12-12196
12-12197 12-12198
12-12199 12-12200
12-12201 12-12202
12-12203 12-12213
12-12214 12-12604
12-12857
DUNNING K L
12-12664
DUPUY M G
12-12809
DYAKOV S P
12-12470 12-12471
DZHELEPOV B S
12-12677

E

EADES R G
12-12544
EBERLE E
12-12610
EDGE R D
12-12543
EDISON DAVID H
12-12272
EDMONDS A R
12-12834
EDWARDS J W
12-12256
EGELSTAFF P A
12-12640 12-12760
EHRLICH M
12-12493
EKSPONG A G
12-12622
ELDRIDGE AARON
12-12775
ELIOFF TOM
12-12672
ELLINGHAUSEN H C
12-12717
ELLIS MARIE F
12-12190
ELLIS W P
12-12752
ELMORE W C
12-12498
ELROD HAROLD G JR
12-12728 12-12730
EMPSON FLEMING M
12-12169
ENGLE PAUL M
12-12162
ENGLER A
12-12477
EPP E R
12-12205
EPSTEIN A
12-12153
EPSTEIN HAROLD M
12-12863
EPSTEIN R
12-12724
ERWAY C H
12-12351
ESELSON B N
12-12455
EVANS MARTHA W
12-12362

F

FAIRLIE D B
12-12566
FAIRSTEIN E
12-12529
FEATHERSTONE R P
12-12814
FEDOROV G B
12-12420
FEHR EDITH B
12-12603
FELTEN EDWARD J
12-12302
FIELD J C
12-12632
FILIPKOWSKI A
12-12605
FINDLAY J B
12-12354
FINK FREDERICK W
12-12216 12-12382
FINK R W
12-12793
FINKELSTEIN D
12-12493
FINKELSTEIN R
12-12884
FINNEY R C
12-12403
FIRMAN E C
12-12354
FISHER D E
12-12784
FITCH S H
12-12725
FITOUSSI L
12-12703
FITZGERALD S
12-12807
FLANDERS DONALD A
12-12238
FLESCH GERALD D
12-12326
FLETCHER J E
12-12773
FLEURY J
12-12589
FOLMER MARIE-MADELEINE
12-12422
FORBES S G
12-12740
FOREMAN A J E
12-12276
FOREMAN BRUCE MILBURN JR
12-12785
FORESTIER HUBERT
12-12421
FOURNET G
12-12564
FOWLER ALAN B
12-12277
FOWLER WILLIAM P
12-12672
FRASER P D B
12-12237
FRAZER B C
12-12482
FRAZER JACK W
12-12229
FREASIER BEN E
12-12303
FRICKE HUGO
12-12238
FRIEDEL JACQUES
12-12422
FRIEDL E BURT
12-12216
FRIEDLANDER G
12-12789 12-12791
FRIEDMAN L
12-12284
FRIEDMANN N E
12-12401
FRIES B C
12-12521
FROLOV V M
12-12222
FRYE GLENN M JR
12-12650
FUCHS F
12-12434
FUHRMAN N
12-12411
FULLER DUDLEY D
12-12346
FULLER R C
12-12211

G

GAILEY E P
12-12123
GALLAGHER J G
12-12708
GALLUP K W
12-12893
GAMBILL W P
12-12357
GARBE R W
12-12758
GARVEY J E
12-12726
GARVIN H L
12-12675
GASSER F R
12-12768
GATES J W JR
12-12333
GAULDEN MARY ESTHER
12-12118
GELLER L
12-12724
GEMMELL D S
12-12543
GENGOZIAN N
12-12188
GERDS ARNOLD F
12-12404
GERHOLM T R
12-12535 12-12667
GERSCH H A
12-12484
GERSHTEIN S S
12-12624
GHIORSO A.
12-12329 12-12930
GIARDINI A A
12-12381
GIESLER H W
12-12696
GIFFEN P H
12-12753
GIFT E H
12-12713
GILBERT J C
12-12632
GILLETTE J H
12-12534
GILLIS DONALD C
12-12848
GILLY LOUIS
12-12672
GINOZA WILLIAM
12-12301
GLICKSMAN M
12-12464
GOBERT G
12-12636
GOLDBERG A
12-12818
GOLDBERG COLMAN
12-12486
GOLDBERGER M L
12-12612
GOLDBLITH SAMUEL A
12-12108
GOLDENBERG J
12-12835
GOLDIN A S
12-12267
GOLDRING B G
12-12816
GOLDSTEIN H
12-12866
GOLIK A Z
12-12435
GOLYSHEV G I
12-12629
GONNI P J
12-12250
GONSER B W
12-12402
GOODLEY H
12-12398
GORDADZE G S
12-12861
GORDON B E
12-12502
GORDON PEGGY KNONG
12-12297
GRABAR PIERRE
12-12191

GOAFF CHARLES
12-12542
GRAY R J
12-12897
GREANEY W A
12-12722
GREAR JAY W JR
12-12517
GRECHUKHIN D P
12-12795
GREEN JOHN R
12-12476
GREEN S J
12-12359 12-12364
GREEN T M
12-12675
GREENE N D
12-12357
GREENLEES G W
12-12845
GREENSTREET R L
12-12370
GREY JERRY
12-12762
GRIGOREV E P
12-12677
GRIGOROV N L
12-12655
GRIMES W R
12-12340
GRIMMETT F S
12-12151
GRISON EMMANUEL
12-12422
GROMAKOV S D
12-12560
GROSS M R
12-12717
GRUBER R A
12-12403
GRUBEN M R
12-12401
GRUZIN P L
12-12420
GUAN-CHAO CHOU
12-12888
GUYMON P H
12-12714

H

HAACK L A
12-12713
HAENDLER HELMUT M
12-12774
HAFFMAN R J
12-12442
HAFFORD J A
12-12707
HAGEE G RICHARD
12-12267
HALL W R
12-12366
HALSTED L R
12-12750
HAMBURGER A I
12-12673
HAMER F
12-12694
HAMILTON J
12-12937
HAMILTON WALTER C
12-12462
HAMMOND E J
12-12315
HANNAN R S
12-12287
HANSEN G E
12-12803
HANSON O G
12-12737
HANUS J F
12-12295
HARDY HUDSON JR
12-12618
HARLOW FRANCIS H
12-12362
HART R G
12-12318
HARTFIELD G L
12-12747
HARTGERING JAMES P
12-12214
HARTIG J J
12-12148
HATCH F N
12-12666
HAUBENREICH P N
12-12706
HAUN R D JR
12-12869
HAYAKAWA TERUO
12-12537 12-12538
12-12539
HAYNES W R
12-12442
HAZEL J F
12-12298
HEIN ROBERT A
12-12631
HEINBERG M
12-12615
HELD S
12-12253
HELLENS R L
12-12635
HENDERSON F H
12-12143
HENKEL R L
12-12846
HENNION G F
12-12234
HENO Y
12-12563
HENRY HUGH F
12-12890
HENSHALL R D
12-12443
HENSHAW PAUL S
12-12137
HERENGUEL JEAN
12-12424
HEREWARD H G
12-12803
HEROLD T RICHARD
12-12278
HERRMANSFELDT W B
12-12852
HETRICK D L
12-12726
HICKEY EDWARD C
12-12175 12-12177
HICKS CLARK T
12-12335
HICKS D
12-12688
HILCKEN JOHN A
12-12112 12-12136
12-12137 12-12138
12-12139 12-12140
12-12141 12-12142
12-12195 12-12196
12-12197 12-12198
12-12199 12-12200
12-12201 12-12202
12-12203 12-12213
12-12214 12-12604
12-12857
HILLMAN PETER
12-12828 12-12829
12-12841
HILTON H H
12-12665
HILVETY N
12-12713
HOARE M F
12-12759
HOBBS WILLARD EARL
12-12871
HODGSON T S
12-12592
HOLDEN P B
12-12411
HOLLANDER J M
12-12659
HOLZMANN B T
12-12229
HOOTON D J
12-12879
HORAN J P
12-12157
HOWARD W F
12-12486
HUBBELL H H JR
12-12321 12-12584
HUBERT P
12-12492
HUDIS J
12-12789
HUGHES D G
12-12564
HUGHES DONALD J
12-12658
HULL D
12-12429
HUMPHERYS KENT C
12-12144
HURST G S
12-12503 12-12583
HUTCHINSON FRANKLIN
12-12294

I

IANCHEVSKAIA I S
12-12677
ICHIMIYA TORAO
12-12300
IGNATOV D V
12-12479
IGO GEORGE
12-12844
IKEGAMI HIDETSUGU
12-12574
ILBERY PETER L T
12-12191
ILLIES K
12-12113
IMHOF WILLIAM
12-12601
INGHAM ROBERT J
12-12532
INSLEY H
12-12340
IOFFE M S
12-12805
ISBIN H S
12-12365
ISHIGURO MASAKAZU
12-12488
ITSKEVITCH E S
12-12456
IZAKOV M N
12-12629
IZZO T F
12-12311 12-12314

J

JACKSON H E
12-12613
JACKSON HORACE G
12-12530
JACOBS R T
12-12720
JACROT B
12-12636
JANKOWSKI F J
12-12683
JARRETT A A
12-12160
JOHANSSON ARNE
12-12841
JOHNSON D E
12-12405
JOHNSON FREDERIC A
12-12274 12-12354
JOHNSON NOAH R
12-12856
JOHNSON R E
12-12415
JOHNSON R U
12-12315
JOHNSTON HERRICK L
12-12271
JOHNSTON L H
12-12814
JOHNSTONE H F
12-12173
JONES HARDIN B
12-12213
JONES J O
12-12311 12-12314
JONES LLEWELLYN H
12-12323 12-12870
JORDAN HARRY S
12-12172
JUDD B R
12-12859
JUPAW G
12-12265
JUREVIC H G
12-12403

K

KAHN B
12-12268
KAKUSHADZE T I
12-12861
KALIBJIAN RALPH
12-12601
KALINACHENKO V P
12-12224
KALLMAN DONALD
12-12737 12-12766
KALMON BEN
12-12161
KANDA FRANK A
12-12244
KANEKO S
12-12606
KANUSTINSKIY A F
12-12275
KANZAKI HIROSHI
12-12487
KAPLAN LOUIS
12-12273
KAPLON M F
12-12477
KARTASHEV G P
12-12525
KARZAS WILLIAM J
12-12875
KASATKIN A M
12-12629
KASS STANLEY
12-12386
KATZ L
12-12788
KATZ SAMUEL
12-12447
KAUFMAN JOYCE J
12-12232
KAVANAGH DEVEREUX L
12-12820
KAZANSKII YU A
12-12578
KEHOE R B
12-12892
KEIGHER DON J
12-12165
KELLER DOUGLAS V JR
12-12244
KELLER W E
12-12282
KELLY P N
12-12151
KELLY W H
12-12567
KENNETT T J
12-12794
KENNEY ROBERT W
12-12619
KENT JOHN F
12-12133
KETZLACH NORMAN
12-12719
KHAVKIN L P
12-12531
KHYM JOSEPH X
12-12233
KIDDER RAY E
12-12358 12-12507
12-12508
KINCH JOHN
12-12569
KINCHELOE G W
12-12389
KING ADEN J
12-12244
KINSLEY T G
12-12378
KIRCHER JOHN F
12-12293
KISDNASEMY S
12-12594
KISIEL T J
12-12754
KLAHR CARL
12-12729
KLAPMANN J
12-12477
KLEIN D
12-12683
KLEIN MELVIN P
12-12235
KLEMCHUK PETER P
12-12540 12-12541
KNABE W E
12-12722
KNAPP EDWARD A
12-12619
KNESTRICK G L
12-12627
KNOWLES J W
12-12571
KNOX BRUCE E
12-12291
KODERA KUMASABURO
12-12509
KOEHLER W C
12-12484
KOEPENICK F R
12-12398
KOHLER D
12-12665
KOKIN G A
12-12629
KOKONOVA M G
12-12861
KOLGANOV V Z
12-12596
KOLPAKOV M I
12-12600
KOMAR A P
12-12528
KONDRASHEV L F
12-12873
KONYUKOV M V
12-12501
KOPELIOVICH I M
12-12561
KORNFELD M J
12-12722
KORSHUNOV YU V
12-12810
KOSKI W S
12-12232
KOSTENKO M S
12-12135
KOSTRUKOV V N
12-12456
KRAMER VIVIAN
12-12305
KRATSIK B
12-12677
KREKELER JEROME H
12-12335
KRISTAL EDWARD
12-12178
KROHN V E
12-12639
KRYLOV O V
12-12222
KURASCHEWSKI O
12-12440
KUCHOWICZ B
12-12876
KUHN H G
12-12545
KUPER J B H
12-12186
KURASHEV A A
12-12873
KURKER CHARLES JR
12-12175 12-12176
KUROCHKIN S S
12-12812 12-12813
KUSHNERIUK S A
12-12735
KUSHNIRENKO A N
12-12656

L

LADD J A
12-12281
LAING F W
12-12490 12-12653
LAISK E
12-12593
LAMB F
12-12534
LAMPI F E
12-12814
LANDER RICHARD
12-12672
LARSON A M
12-12722
LARSON H C
12-12365
LARSON J B
12-12313
LARSON K H
12-12200
LATTER RICHARD
12-12875
LAVRUKHINA A K
12-12796
LAX MELVIN
12-12880
LAZAREV B G
12-12472
LAZARUS DAVID
12-12399
LAZAREV A I
12-12317
LEBEDEV A V
12-12596
LEBLOND C P
12-12210
LEE L L JR
12-12792
LEEK C B
12-12774
LEFEBVRE JEAN
12-12241
LEFORT MARC
12-12460
LEHMANN PIERRE
12-12662
LEIDHEISER HENRY JR
12-12388

LEMMON RICHARD M
12-12297
LEMON R B
12-12774
LEVEN M M
12-12367
LEVENBAUM L H
12-12175
LEVEQUE ANTOINE
12-12662
LEVINE SAMUEL
12-12227
LEVITAS ALFRED
12-12880
LEVOY MYRON M
12-12763
LEYSE C F
12-12722
LIBERMAN YE A
12-12581
LINDBERG R G
12-12200
LINDENBAUM S J
12-12840
LIPINSKI R
12-12122
LIPWORTH E
12-12675
LITTAUER RAPHAEL
12-12613
LITTLE E M
12-12498
LIVINGSTON I
12-12493
LIVINGSTON R S
12-12548 12-12549
LIVSHITS N S
12-12629
LOCH LUTHER D
12-12380
LOCKWOOD E H
12-12445
LOGUNOV A A
12-12886
LOGUNOV V N
12-12811
LOLOS L K
12-12252
LOMANOV V F
12-12597
LONG E A
12-12243
LONG F J
12-12756
LONG W L
12-12635
LOONEY DELLA
12-12126 12-12127
LORENZ R A
12-12383
LOUGHEED M N
12-12205
LOUTIT JOHN F
12-12191
LOVE L O
12-12550
LOVE T A
12-12857
LOW SIDNEY
12-12771
LOWE A E
12-12590
LOWE J
12-12845
LOZHKINA G S
12-12263
LUBERT M
12-12585
LUDWIG G W
12-12669
LUEBKE E A
12-12743
LUNDY R A
12-12623
LUSTMAN B
12-12741 12-12754
LYNCH DAVID W
12-12448
LYNCH E E
12-12777
LYNDE ELIZABETH M
12-12289

M

MAAK R O
12-12710
MARUCHI HISAO
12-12225
MACDONALD WALTER JR
12-12396
MACGREGOR MALCOLM H
12-12823
MACHTA LESTER
12-12195
MACKLIN R L
12-12890
MACPHERSON R E
12-12356
MACRAE T P
12-12237
MADDEN D A
12-12307
MAGNO P J
12-12337
MAHLMAN H A
12-12292
MAILLOT J P
12-12765
MAKINODAN T
12-12188
MAKOV R N
12-12805
MALAKHOV A N
12-12527
MALCOLM V T
12-12771
MALLIK C R
12-12607
MANDEVILLE C F
12-12820
MANN LLOYD G
12-12504
MAO T J
12-12230
MARCH P V
12-12786
MARGEN P H
12-12759
MARIS TH A J
12-12828 12-12829
12-12830
MARJON P L
12-12864
MARK R
12-12687
MARRA J V
12-12234
MARSHAK R E
12-12621 12-12843
MARTIN DOUGLAS L
12-12467
MARTIN J A
12-12548 12-12549
MARTIN J J
12-12295
MARTON L
12-12833
MASANOVA N D
12-12629
MASON DAVID M
12-12390
MATHER R L
12-12112
MATHERS W G
12-12318
MATHESON M S
12-12290
MATINYAN S G
12-12625
MATSUMAE KAZUYOSHI
12-12300
MATSUO H
12-12296
MAYDEW R C
12-12452 12-12516
MAZO R M
12-12240
MAZZETTI FRANCO
12-12297
MCCAULEY G P
12-12652
MCCLAINE L A
12-12339
MCCLELLAND W M
12-12615
MCCRIRICK H
12-12682
MCCUSKER P A
12-12234
MCDONOUGH R
12-12403
MCGRUER J N
12-12673
MCHENRY J R
12-12473
MCHUGH R J J
12-12369
MCIVER F M
12-12850
MCKAY C
12-12735
MCKAY J W
12-12205
MCKINLEY JOHN D JR
12-12239
MCKINLEY THOMAS W JR
12-12192
MCLACHLAN DAN JR
12-12458
MCLAIN H A
12-12713
MCLAUGHLIN J K
12-12432
MCLAUGHLIN MARY M
12-12132
MCMULLEN W D
12-12416
MCMURRAY W R
12-12189
MCNABB WALLACE M
12-12298
MCNOWN J S
12-12685
MEADOWS J W
12-12836
MEDCALF W F
12-12575
MEERON EMMANUEL
12-12558
MEESSEN A
12-12588
MEINKE W WAYNE
12-12533
MELESHKO E A
12-12810
MERIS TH A J
12-12580
MERRILL J A
12-12720
MERRILL JOHN P
12-12191
MESHKOV SYDNEY
12-12674
METCALFE KENNETH
12-12426
MEYROWITZ ROBERT
12-12393
MILLARD C I
12-12518
MILLER DONALD G
12-12245
MILLER FRANCIS J
12-12255
MILLER PAUL D
12-12216 12-12382
MILLER R A
12-12865
MILLER W R
12-12515
MILLSAP W A
12-12311
MILNER G W C
12-12256
MIRSKAYA G G
12-12456
MISKEL JOHN A
12-12504
MITCHELL R I
12-12168
MIXON W R
12-12712
MOEM R H
12-12365
MOGILNITSKII B N
12-12130
MOISEYEV V D
12-12551
MOON P B
12-12670
MOORE C V
12-12851
MOORE D
12-12590
MOORE R E
12-12340
MOORE W E
12-12673
MOORE WILLIAM H
12-12618
MORGAN D
12-12798
MORGAN KARL Z
12-12197
MORGAN P S
12-12862
MORGAN W W
12-12318
MOROZOV P M
12-12805
MORRISON DONALD R
12-12559
MORROW P E
12-12199
MORTON W T
12-12786
MOSES H
12-12626
MOSHER D R
12-12365
MOSKOWITZ BERNARD R
12-12727
MOSS T R
12-12513
MOTEFF J
12-12697
MOUNT R H
12-12635
MOYERS J C
12-12368
MURATA TOSHIFUMI
12-12316
MURPHY GLENN
12-12371
MURRAY R C
12-12224
MUSTELIER JEAN-PIERRE
12-12896
MYERS ORLO E
12-12219

N

NAGLER KENNETH M
12-12195
NAHMIAS M E
12-12645
NAISH S T
12-12513
NATHAN H A
12-12211
NEAL RICHARD B
12-12797 12-12808
NELLI JOSEPH R
12-12335
NERTNEY R J
12-12720
NESBET R K
12-12881
NESHCHADIMENKO I P
12-12135
NESHPOR V S
12-12441
NEUVAR ERWIN W
12-12309
NEWCOMBE H B
12-12121
NEWGARD JOHN J
12-12763
NEWTON J O
12-12842
NICHON G
12-12703
NIELSEN J W
12-12304
NIERENBERG W A
12-12675
NIKITIN S YA
12-12596
NIKOLAEV G I
12-12419
NILSSON S
12-12622
NISHIMURA KEIICHI
12-12839
NISHIOKA ATSUO
12-12299 12-12300
NOBLE PAUL JR
12-12338 12-12339
NORMAN AMOS
12-12301
NOVEY T B
12-12639
NOVIKOVA R E
12-12193
NOYES LEROY C
12-12778
NOYES RICHARD M
12-12227 12-12228
NURMIA M J
12-12793
NYER W E
12-12740

O

OBERG A G
12-12303
ODELL W W
12-12685
OIKAWA MITSURU
12-12546
OISHI J
12-12295
OKA SHUMPEI
12-12546
OKAZAKI M
12-12606
OKUBO S
12-12621
OLOFSON C T
12-12408
ONEIL D P
12-12149
ORHEL T P
12-12568 12-12781
OSBORNE D W
12-12215
OSWALD LARRY
12-12672
OWAKI MASAKAZU
12-12299
OWEN R D
12-12188

P

PACHUCKI C F
12-12232 12-12242
PAEGMOV V F
12-12506
PAGLIARO J A
12-12148
PAIGE D M
12-12151
PALATNIK L S
12-12561
PALLADINO N J
12-12686
PALMER J H
12-12166
PANASYUK V S
12-12810
PANCHENKOV G M
12-12551
PANIKKAR S K
12-12431
PANKEY J W
12-12220
PANOFSKY W K H
12-12611
PARKER GEORGE W
12-12742
PARNELL J
12-12520
PARSONS MARGARET A
12-12297
PATOSKI V A
12-12864
PAULSEN F R
12-12180
PAXTON H C
12-12893
PEARLMAN H
12-12694
PECHIN W H
12-12439
PEPINSKY RAY
12-12482
PEREZ-MENDEZ VICTOR
12-12601 12-12619
PERKINS M
12-12261 12-12262
PERRY ROBERT B
12-12118
PESHKOV V P
12-12511
PETERSON RUDOLPH E
12-12447
PETROW H G
12-12337
PETTERSSON B G
12-12667
PFISTERER H
12-12434
PHILLIPS GERALD C
12-12662
PICKENS JACKSON R
12-12576
PIEPER A G
12-12716
PIERONI J J
12-12281
PILCHER J M
12-12168
PIRIE A
12-12204
PITT CHARLES H
12-12319
PLACAK O R
12-12198
PLISKE EDWARD C
12-12133
PLOCK L E
12-12403
PLUSQUELLEC JACQUES
12-12425
PLYLER EARLE K
12-12285
POBEREZKIN MEYER
12-12775
PODGORNYI M
12-12500
POINDEXTER EDWARD
12-12381

POLIKARPOV YU A
12-12420
POLITYCKI A
12-12434
POLKINGHORNE J C
12-12566
POLMEAR I J
12-12436
POMERANTZ M A
12-12478
PON N G
12-12325
POPE A L
12-12632
POPP J D
12-12556
PORTER F S
12-12313
PORZEL F B
12-12739
POST BEN
12-12302
POTNIS V P
12-12678
POWDERLY J E
12-12575
POWELL WILSON M
12-12672
PRATER H K
12-12550
PREOBRAZHENSKII B K
12-12677
PROCTOR BERNARD E
12-12108
PRUDKOVSKAIA O V
12-12499
PURKE H
12-12577

Q

QUARLES LAWRENCE R
12-12744
QUINDRY JACQUES
12-12662
QUINN M E
12-12408

R

RABIN B R
12-12325
RAMIREZ ERNEST R
12-12567
RAMSEY W J
12-12770
RANA A R
12-12769
RANDLES J
12-12490
RANKIN M O
12-12573
RAPP KARL
12-12405
REED J M
12-12628
REIN JAMES E
12-12251
REITMANN D
12-12855
REMALEY CHARLES W
12-12453
REMEIKA J P
12-12305
RENSEN J S
12-12279
REYNOLDS G E
12-12260 12-12261
12-12262
REYNOLDS GEORGE T
12-12618
REYNOLDS S A
12-12268
RICHARDSON PHILIP H
12-12108
RINGO G R
12-12639
RITCHIE R H
12-12584
RITTENBERG D
12-12542
RITTENHOUSE JOHN B
12-12390
ROACH C H
12-12393
ROBBINS A B
12-12845
ROBERTS H E
12-12114
ROBERTS S J
12-12489 12-12490
ROBERTSON R F S
12-12849
ROCHE THOMAS KIRBY
12-12409
ROD ROBERT L
12-12280
ROGERS H J
12-12207
ROGERS K C
12-12614
ROGINSKII S Z
12-12222
ROLPH P M
12-12845
ROLSTEG ROBERT F
12-12269
ROLSTEN R F
12-12403
ROSENBAUM D A
12-12409
ROSENTHAL D
12-12401
ROSENZWEIG NORBERT
12-12671
ROSMAN HOWARD
12-12228
ROSS H F
12-12403
ROSS J E
12-12156
ROSS M A S
12-12874
ROSSI HARALD H
12-12585
ROSSIN D
12-12694
ROTENBERG MANUEL
12-12882
ROTHSTEIN ASER
12-12117
ROURKE F M
12-12552
ROWE P W
12-12375
RUBCHINSKII S M
12-12522
RUCKENSTEIN E
12-12363
RUEHLE WILLIAM G JR
12-12570
RUSSELL ALLAN M
12-12483
RYABCHIKOV D I
12-12306 12-12317
RYBKA T W
12-12788
RYON A D
12-12310

S

SACHER GEORGE A
12-12139
SAKAI MITSUO
12-12574
SAKURAI J J
12-12651
SAMOILOV B N
12-12456
SAMOILOV L N
12-12657
SAMPSON R C
12-12367
SAMSONOV G V
12-12441
SATCHELL D P N
12-12742
SAUER A
12-12634
SAUNDERS WILLIAM H JR
12-12272
SAVCHENKO E D
12-12130
SAVITSKII E M
12-12418
SAXENA G M
12-12266
SCALISE D T
12-12804
SCHAEFER HERMANN J
12-12134
SCHARENBERG R P
12-12816
SCHAWLOW A L
12-12485
SCHIEFER J P
12-12792
SCHNEIDER ALFRED
12-12286
SCHNEIDER H
12-12855
SCHOCH A
12-12800
SCHOTT G L
12-12236
SCHREIBER RAEMER F
12-12764
SCHRODT ARIEL G
12-12214
SCHROEDER JOHN B
12-12382
SCHULZ WALLACE W
12-12309
SCHUMACHER E
12-12394
SCHWARTZ CHARLES M
12-12382
SCHWARTZ ROBERT B
12-12658
SCHWINGER JULIAN
12-12885
SCOTT R
12-12891
SEABORG G T
12-12329 12-12330
SEAGREN H E
12-12534
SEARCY ALAN W
12-12630
SEBENICK J J
12-12402
SEGRE EMILIO
12-12672
SEGUIN MAURICE
12-12422
SEITZ FREDERICK
12-12399
SEKERSKII S
12-12796
SELLA CLAUDE
12-12288
SEMENOV S S
12-12811
SEMIGLAZOVA E D
12-12194
SENEGACNIK MARJAN
12-12217
SENN P L
12-12356
SENS J C
12-12623
SERDYUK P L
12-12761
SERGIENKO V A
12-12526
SERGY W M
12-12295
SESHADRI T R
12-12266
SEWIG RUDOLF
12-12519
SHAFER HAL J
12-12152
SHAFTMAN D H
12-12693 12-12694
SHALGOSKY H I
12-12260
SHANNON D W
12-12218
SHAPIRA RAYMOND
12-12233
SHAROVA A K
12-12342
SHATENSHTEIN A I
12-12224
SHAW D F
12-12325
SHEFFIELD J C
12-12552
SHELTON R D
12-12769
SHER N C
12-12364 12-12364
SHERMAN J
12-12686
SHILLING C W
12-12181
SHILYAEV B A
12-12523
SHIMMIN P L
12-12311 12-12314
SHINAGAWA MUTSUAKI
12-12316
SHIPKO F J
12-12232
SHIRLEY E L
12-12252
SHIRSHOV V A
12-12582
SHKAPINA V A
12-12135
SHMIDT N YE
12-12226
SHOCKLEY WILLIAM
12-12466
SHULER KURT E
12-12239
SHUTE G G
12-12670
SHVIDKOVSKII E G
12-12629
SIEVERTS A
12-12457
SIKES JOHN H
12-12251
SIKKELAND T
12-12329 12-12330
SILKER W R
12-12145
SILVA E
12-12835
SILVERMAN LESLIE
12-12171 12-12174
12-12175 12-12176
12-12177 12-12178
12-12179
SIMONENKO D
12-12806
SIMPSON J AROL
12-12833
SIMS HARRY M
12-12334
SINGER S F
12-12475
SINHA M S
12-12607
SIRLIN J L
12-12209
SJOSTRAND N G
12-12681
SKALSKA S
12-12253
SKLYARENKO YU S
12-12306
SKRZYPEZAK E
12-12605
SLAUGH LYNN H
12-12231
SMALES A A
12-12258 12-12259
SMALLER B
12-12290
SMIRNOV A P
12-12472
SMITH D F
12-12322
SMITH FRED L
12-12334
SMITH J H
12-12790
SMITH KENNETH
12-12819
SMITH P C
12-12154
SMITH V H
12-12206
SMOLYANKIN V T
12-12596
SNIDER A R
12-12693
SNOW GEORGE A
12-12648
SNOWDON S C
12-12821 12-12822
SNYDER M S
12-12586
SOERGEL VOLKER
12-12854
SOKOLOV A A
12-12505 12-12817
SOKOLOV V A
12-12226
SOLOMON IONEL
12-12661
SOMMERS H S JR
12-12282
SOMOGYI A
12-12605
SONDER E
12-12109
SOOD B S
12-12670
SOROKIN V K
12-12438
SOROKO L M
12-12825
SOWDEN R G
12-12289
SPEAR W G
12-12572 12-12573
SPEEDS JOHN A
12-12355
SPICER G S
12-12143 12-12257
SPIEWAK I
12-12707
SPITZER RICHARD
12-12668
SPOERL EDWARD
12-12126 12-12127
SPRINGER T H
12-12725
SRIVASTAVA K G
12-12479
STABILE JOSEPH N
12-12132
STAHELIN P
12-12852
STANNARD J N
12-12199
STARIK A S
12-12263
STARIK I YE
12-12263
STARODUBTSEV S V
12-12678
STATTON W O
12-12872
STEACIE E W R
12-12247
STECH BERTHOLD
12-12854
STEELE M C
12-12464
STEEVES A F
12-12415
STEIMERS J
12-12110
STEIN H J
12-12850
STEIN P C
12-12614 12-12620
STEINER HERBERT M
12-12672
STEPHENS F S
12-12842
STERN MILTON
12-12392
STERNHEIMER R M
12-12840
STERRETT K F
12-12428
STEVENS D K
12-12109
STEWART F S
12-12125
STEWART J E
12-12722
STEWART OLIVER M
12-12382
STONE R S
12-12562
STONE WILSON S
12-12131
STORCHHEIM SAMUEL
12-12413
STORER JOHN R
12-12138
STRAUB C P
12-12267
STRAUSS ULRICH P
12-12283
STRELKOV I G
12-12456
STRICKLAND J D H
12-12257
STROGANOVA N S
12-12306
STROMINGER D
12-12659
SUCHY KURT
12-12495
SUDARSHAN E C G
12-12621
SUDDETH J A
12-12833
SUDOVTSEV A I
12-12472
SUGIOKA ETSU
12-12488
SUGIURA TOSHIO
12-12537 12-12538
12-12539
SUNDERMAN DUANE N
12-12775
SUNDIN C W
12-12520
SVEC HARRY J
12-12326
SWANSON R A
12-12623
SWARTZ L M
12-12755
SWIFT D L
12-12307
SZUTKA A
12-12298
SZYMANSKI Z
12-12643

T

TAFITLIN K L
12-12387
TAGLIAFERRI GUIDO
12-12618
TAJIMA MORITAKA
12-12299
TAKAHASHI NORORU
12-12423
TAKASHI YOICHI
12-12546
TALITSKAYA L V
12-12263
TAMURA TEIJIRO
12-12509
TANAKA KATSUMI
12-12647
TANANAYKO YU M
12-12360 12-12361
TARRAGO XAVIER
12-12460
TARZWELL JOHN W
12-12848
TAUBE M
12-12328
TAYLER R J
12-12490 12-12491
TAYLOR J C
12-12617
TAYLOR LAURISTON S
12-12182 12-12184
TELEGDI V L
12-12623 12-12639
TENZER LEON
12-12482
TERNOV I M
12-12505
TERRILL J G JR
12-12203
TEUTSCH W B
12-12621
THAXTER M D
12-12170
THOMA R E
12-12340
THOMAS ROBERT D
12-12248
THOMASON PAUL F
12-12255
THOMPSON M E
12-12393
THOMPSON ROY C
12-12212
THOMPSON W B
12-12489
THURBER W C
12-12897
TIBELL GUNNER
12-12841
TIMBLIN L O JR
12-12376
TIMUSHEV G F
12-12595
TIPELLIS G G
12-12772
TLEUBERGENOVA G
12-12264
TODD MARY E
12-12895
TOLBERT N E
12-12123 12-12124
TOLLIN GORDON
12-12119
TOMBAUGH R W
12-12442
TORKAR K
12-12223
TOVE P A
12-12536 12-12579
TREIMAN S B
12-12612
TRESHOW M
12-12693 12-12694
TREUMAN GEORGE
12-12313
TRICE J B
12-12591 12-12637
TRILLAT JEAN-JACQUES
12-12288
TRIPLETT J R
12-12770
TRUELL ROHN
12-12437
TRUEMAN GEORGE
12-12312
TRURAN W H
12-12159
TUCKER E B
12-12814
TURKOT F
12-12615
TURNER C M
12-12815
TYLKINA M A
12-12418
TYREN H
12-12580 12-12828
12-12829 12-12830

U

UPETSKY JACK L
12-12619
URSO PAUL
12-12192
USTINOV V B
12-12526
UYETANI R
12-12769

V

VALOVAGE W D
12-12406
VAN HEERDEN I J
12-12855
VAN WINKLE R
12-12714 12-12715
VANZANDT T E
12-12494 12-12628
VARSHAVSKII YA M
12-12224
VAUGHAN DALE A
12-12382
VENTERS LYDIA
12-12455 12-12456
12-12660 12-12805
12-12806
VERDE M
12-12878
VIKLUND H I
12-12313 12-12315
VILLFORTH J C
12-12321
VINEYARD GEORGE H
12-12638
VOGT-NILSEN NILS
12-12801 12-12802
VOIGT A F
12-12146
VOIKHANSKII M E
12-12679
VOLKOV D V
12-12887
VOLLMER L W
12-12301
VON ENGEL A
12-12510
VOROBEV V M
12-12761
VOSKRESENSKAYA N K
12-12226

W

WADSWORTH MILTON E
12-12319
WAGNER M D
12-12833
WAITE D P
12-12777
WALKER R E
12-12210
WALKER P L
12-12616
WALKER ROBERT J
12-12155
WALKER WALTER P
12-12744
WALKINSHAW W
12-12798
WALL G P
12-12332
WALLACE W E
12-12428
WALTON J P
12-12329 12-12330
WANTA R C
12-12626
WARD RAYMOND L
12-12295
WARNER A G
12-12545
WATANABE HIROSHI
12-12833
WATANABE MUNEO
12-12300
WATKINS J WADE
12-12389
WATSON D
12-12243
WATSON R E
12-12881
WEBB M S W
12-12143
WEBBER T J
12-12143
WEBSTER R K
12-12258 12-12259
WEHRLE R D
12-12378
WEHSELAU J E
12-12350
WEIDMANN S M
12-12207
WEINBERG S
12-12621
WEINREICH MARCEL I
12-12519 12-12629
WEISMAN J
12-12772
WEISS H V
12-12201
WELCH JASPER A JR
12-12644
WELLS I
12-12332
WENDLANDT WESLEY W
12-12303
WENDOLKOWSKI W S
12-12341
WERBOUCK ALBERT E
12-12618
WERBURTON E K
12-12853
WERKMEISTER GOTTRIED
12-12519
WESTPHAL W B
12-12449
WETHERELL A M
12-12616
WETSTONE D
12-12493
WHIPPLE G HOYT
12-12185
WHITE E A
12-12552
WHITE HOWARD S
12-12672
WHITE MARGARET P
12-12213
WHITE R H
12-12893
WHITEHEAD W D
12-12787
WHITWHAM DONALD
12-12424
WIBERG KENNETH P
12-12231
WICKEY R O
12-12365
WIEGAND CLYDE
12-12672
WILETS LAWRENCE
12-12834 12-12882
WILKINSON D H
12-12461 12-12663
12-12832
WILLIAMS D E
12-12439
WILLIAMS J H
12-12814
WILLIAMS T E
12-12296
WILSON C W
12-12208
WILSON FLORENCE D
12-12131
WILSON N E
12-12748 12-12749
12-12750
WILSON ROBERT R
12-12615 12-12649
WINEMAN PHILIP L
12-12283
WINGFIELD EDWARD C
12-12278
WITTENBROCK N G
12-12718
WOLCOTT NORMAN M
12-12631
WOLF ALFRED P
12-12284
WOLFENDALE A W
12-12594
WOLLAN E O
12-12465
WONG EUGENE
12-12859
WOOD D P
12-12893
WOODBURY H H
12-12669
WOODWARD KENT T
12-12214
WOODWARD W M
12-12615
WOREL M
12-12229
WRIGLEY E E
12-12774
WROBLEWSKI A
12-12605
WYATT JAMES L
12-12412

Y

YAGLE P A
12-12685
YAMAZAKI TOSHIMITSU
12-12574
YERKOVICH LIKE A
12-12414
YIH C S
12-12685
YNTEMA J L
12-12792
YODER ROBERT E
12-12169
YOUNG H A
12-12333
YOUNG J A
12-12230
YOUNG M P
12-12716
YOVANOVITCH D G
12-12623
YPSILANTIS TOM
12-12672
YVON J
12-12565
YVON P
12-12492

Z

ZAKHAROVA V M
12-12496
ZALKIN A
12-12270
ZARZYCKI JERZY
12-12246
ZAVOISKII V K
12-12761
ZECHELLA A P
12-12751
ZEDLER P F
12-12583
ZEIDMAN B
12-12792
ZELDES NISSAN
12-12646
ZELDOVICH A G
12-12598
ZELDOVICH M P
12-12522 12-12811
ZHDANOV A P
12-12600
ZIEMER RICHARD W
12-12468
ZILL L P
12-12124
ZIPOY D M
12-12615
ZOBEL W
12-12857
ZOLOTAVIN A V
12-12677
ZURZYCKI Z J
12-12254

DEPOSITORIES OF USAEC REPORTS IN LIBRARIES OUTSIDE THE U.S.

The libraries listed below maintain collections of unclassified U. S. Atomic Energy Commission reports for reference use.

ARGENTINA
Buenos Aires, Comisión Nacional de Energía Atómica

AUSTRALIA
Canberra, Australian National Library
Sutherland, New South Wales, Australian Atomic Energy Commission

AUSTRIA
Vienna, Institut für Radiumforschung der Oesterreichischen Akademie der Wissenschaften
Vienna, International Atomic Energy Agency

BELGIUM
Brussels, Centre d'Etudes pour les Applications de l'Energie Nucléaire

BRAZIL
Rio de Janeiro, Instituto Brasileiro de Bibliografia e Documentacao

BURMA
Rangoon, Union of Burma Applied Research Institute

CANADA
Ottawa, National Research Council Library

CEYLON
Colombo, University of Ceylon

CHILE
Santiago, Ministerio de Relaciones Exteriores

COLOMBIA
Bogotá, Instituto Colombiano de Asuntos Nucleares

COSTA RICA
San Pedro, University of Costa Rica Library

CUBA
Havana, Comisión de Energía Nuclear de Cuba

DENMARK
Risö, Danish Atomic Energy Commission

DOMINICAN REPUBLIC
Ciudad Trujillo, National Palace

EGYPT
Cairo, Atomic Energy Commission

ENGLAND
Birmingham, Central Library
Bristol, Central Library
Kingston upon Hull, Central Library
Leeds, Central Library
Liverpool, Central Library
London, Central Library, Acton
London, Science Museum Library, South Kensington
Manchester, Central Library
Newcastle upon Tyne, Central Library
Nottingham, Public Libraries
Sheffield, Central Library

FINLAND
Helsinki, Teknillisen Korkeakoulun Kirjasto

FORMOSA (TAIWAN)
Taipei, National Tsing Hua University Library

FRANCE
Gif-sur-Yvette, Centre d'Etudes Nucléaires de Saclay
Paris, Organization for European Cooperation, Nuclear Energy Library

GERMANY
Berlin, Institut für Kernforschung Berlin
Munich, Technische Hochschule, Bibliothek

GREECE
Athens, Greek Atomic Energy Commission

GUATEMALA
Guatemala Comición Nacional de Energía Nuclear

HAITI
Port au Prince, University of Haiti

ICELAND
Reykjavik, University of Iceland, Atomic Energy Library

INDIA
Bombay, Department of Atomic Energy

IRAQ
Baghdad, The Ministry of Development, Atomic Energy Division

IRELAND
Dublin, University College

ISRAEL
Tel Aviv, Israel Atomic Energy Commission

ITALY
Rome, Comitato Nazionale Ricerche Nucleari

JAPAN
Tokyo, Science Section, Diet Library

KOREA
Seoul, Atomic Energy Commission, c/o Ministry of Education

LEBANON
Beirut, American University

LUXEMBOURG
Luxembourg, Ministry of Transport and Electricity

MEXICO
Mexico, D.F., Comisión Nacional de Energía Nuclear

NETHERLANDS
The Hague, Reactor Centrum Nederland

NEW ZEALAND
Wellington, Department of Scientific and Industrial Research

NORTHERN IRELAND
Belfast, Department of Industrial and Forensic Science

NORWAY
Lillestrom, Institutt for Atomenergi

PAKISTAN
Karachi, Atomic Energy Commission

PERU
Lima, Biblioteca Nacional

PHILIPPINE REPUBLIC
Manila, Interdepartmental Committee on Atomic Energy, c/o National Economic Council

PORTUGAL
Lisbon, Junta de Energía Nuclear

SCOTLAND
Glasgow, Mitchell Library

SPAIN
Madrid, Junta de Energía Nuclear

SWEDEN
Stockholm, Atomenergi AB

SWITZERLAND
Geneva, United Nations Library
Zurich, Institut für Physik, Eidg. Technische Hochschule

THAILAND
Bangkok, Office of the Thai Atomic Energy Commission, Department of Science

TURKEY
Ankara, Turkish Atomic Energy Commission, Atomic Energy Library

UNION OF SOUTH AFRICA
Pretoria, Library and Information Division, South African Council for Scientific and Industrial Research

UNITED NATIONS
New York, N. Y., U.N. Headquarters

URUGUAY
Montevideo, Universidad de Montevideo

VENEZUELA
Caracas, Instituto Venezolano de Neurología e Investigaciones Cerebrales

YUGOSLAVIA
Belgrade, Federal Nuclear Energy Commission

LEGAL NOTICE

The AEC reports listed in this document are accounts of Government sponsored work. Neither the United States, nor the Commission, nor any person acting on behalf of the Commission:

A. Makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained in these reports, or that the use of any information, apparatus, method, or process disclosed in these reports may not infringe privately owned rights; or

B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of any information, apparatus, method, or process disclosed in these reports.

As used in the above, "person acting on behalf of the Commission" includes any employee or contractor of the Commission to the extent that such employee or contractor prepares, handles or distributes, or provides access to, any information pursuant to his employment or contract with the Commission.

UNITED STATES
GOVERNMENT PRINTING OFFICE
DIVISION OF PUBLIC DOCUMENTS
WASHINGTON 25, D. C.

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE TO AVOID
PAYMENT OF POSTAGE, $300
(GPO)

TECHNICAL PROGRESS REVIEWS

The U. S. Atomic Energy Commission, Technical Information Service, publishes an unclassified series of Technical Progress Reviews which provide concise summaries of current atomic developments. Issued quarterly, each of these Technical Progress Reviews digests and evaluates the latest findings in a specific area of nuclear technology and science. The Reviews also report on technology developed in military reactor and other classified AEC programs to the extent that the technology can be dissociated from sensitive military and production data.

The three journals currently published in this series are:

Power Reactor Technology, Walter H. Zinn and associates, General Nuclear Engineering Corporation

Reactor Fuel Processing, Stephen Lawroski and associates, Chemical Engineering Division, Argonne National Laboratory

Reactor Core Materials (covering solid material developments), R. W. Dayton, E. M. Simons, and associates, Battelle Memorial Institute

Each journal may be purchased by subscription (domestic, $2.00 a year; foreign, $2.50 a year) or by individual issue (55¢) from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

The above announcement is unclassified.